July 8, 2010

Via ECFS

Ms. Marline H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: CG Docket No. 09-158, CC Docket No. 98-170, WC Docket No. 04-36

Dear Ms. Dortch:

Please find attached comments prepared by Empirix in response to the Commission's request for comments on the Measurement of Mobile Broadband Network Performance and Coverage. These comments follow up on information provided to the Commission by Empirix during an ex parte meeting in June.

As discussed in our meeting and within these comments, Empirix feels there are significant advantages to measuring mobile broadband network performance at the network level, instead of the handset. The FCC should understand the mobile consumer's experience in the context of a shared resource. In particular, our comments point to how how mobile data is being delivered by cell site and further, and how that system should guide FCC's efforts towards understanding the collective experience of every subscriber on the site. It is the view of Empirix that relying on handset-based applets without having information on the relative performance of different handset types and information on network-wide performance is an incomplete picture. Additionally, network level monitoring allows for a continuous view of the network and its performance, instead of the "snapshot" perspective provided by an applet monitoring system. Empirix technology can aggregate over 3,500 KPIs and identify them by the location of every user on the network, all while ensuring user privacy. This is information unobtainable through an applet.

Should you have any questions regarding these comments or Empirix services, please contact myself in Washington, DC at ryan@strategicmi.com.

Sincerely,

/s/
Ryan S. Bowley

Empirix
Distributed Monitoring Architecture
Overview for Wireless Services

Topics

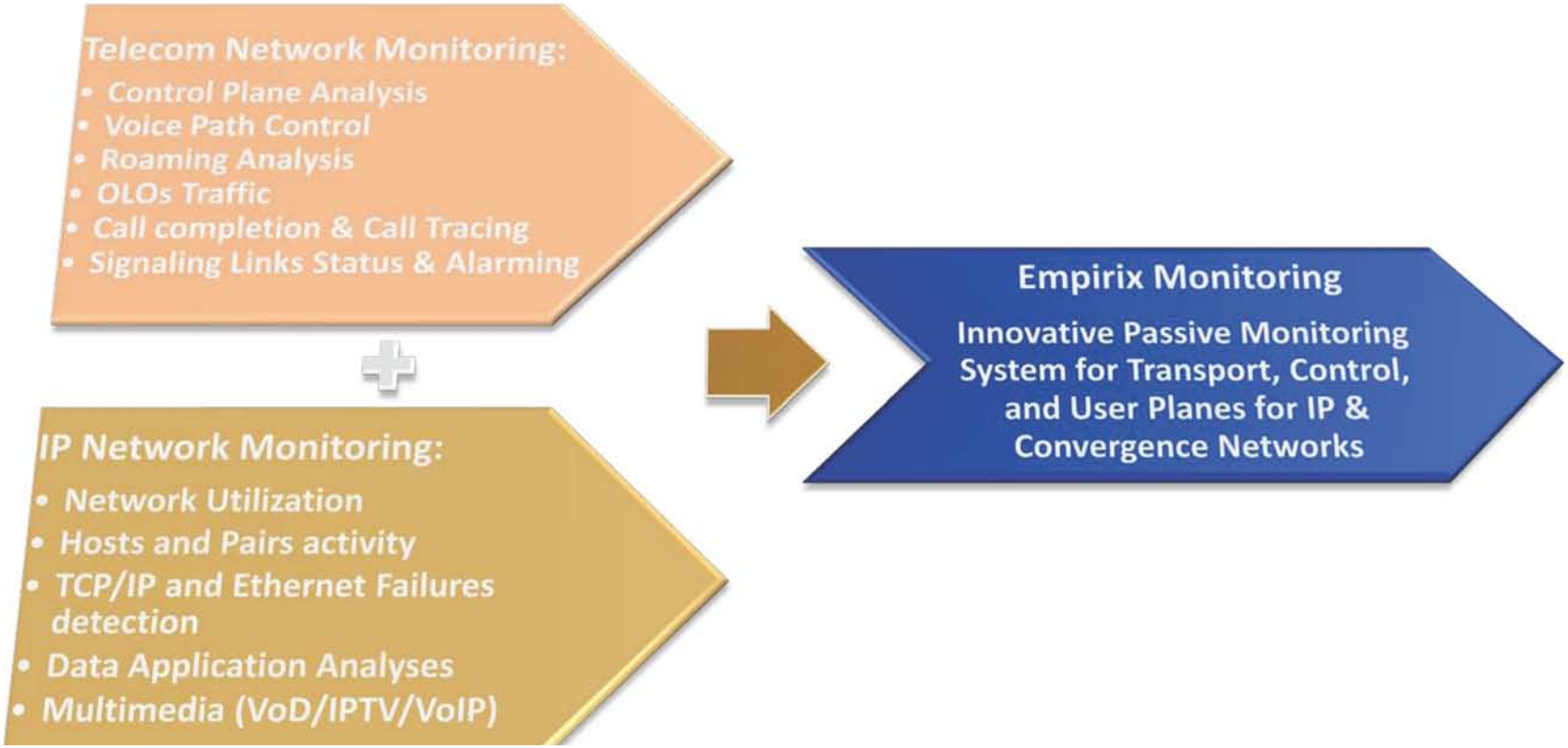
- Empirix overview
- Our Wireless Networks Monitoring solution
- Details on Wireless KPIs provided
- Empirix Advantages & Value Statement

Empirix Excels Where Technology Converges

Why do Operators Deploy Service Assurance Solutions?

- Service quality is a competitive differentiator for customer satisfaction
- Address regulatory concerns
- More effective troubleshooting means lower costs
- Better information for capital investment
- Avoid the “blame game” with equipment suppliers and interconnect partners
  - Independent, element agnostic assessment
  - QoS metrics within network elements do not provide an end-to-end network view

Empirix offers the first NGM: Next Generation Monitoring System



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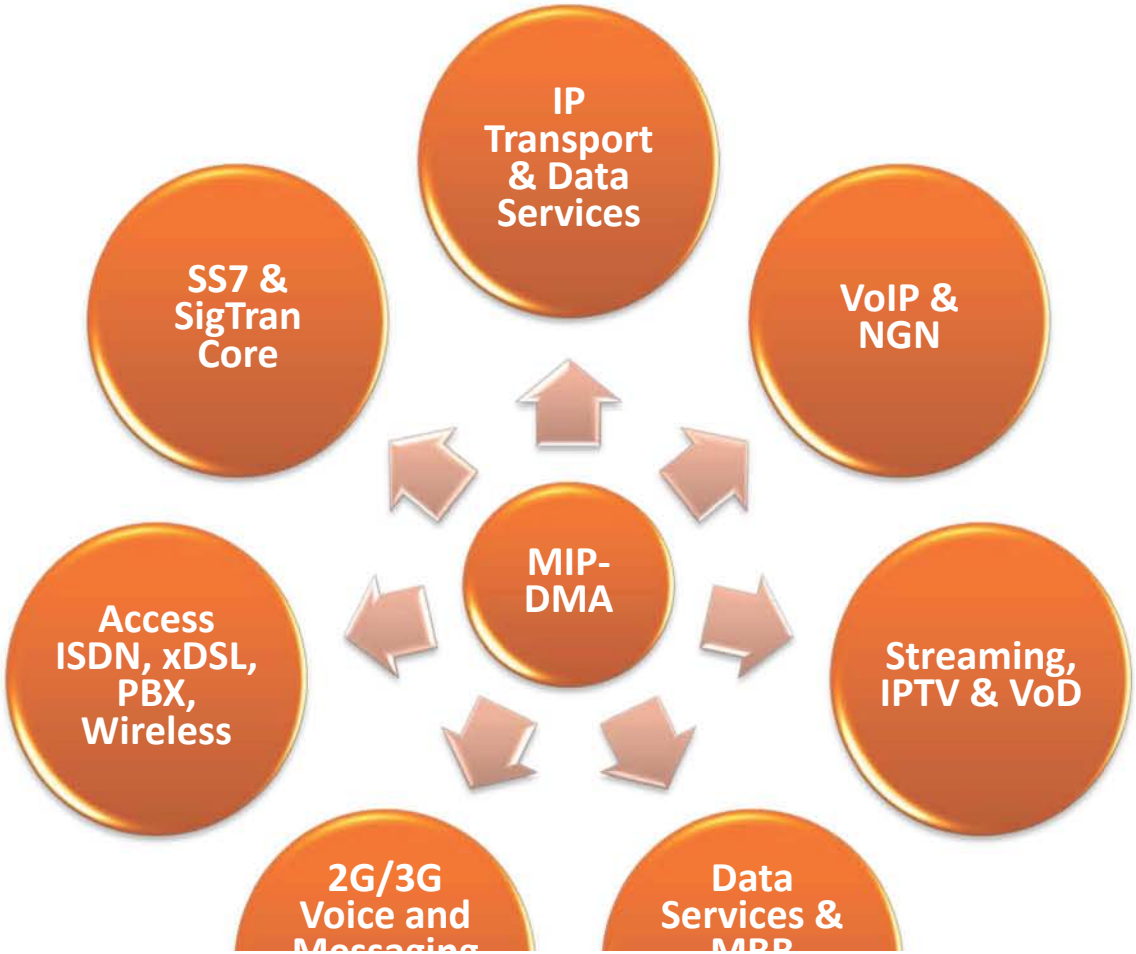
Empirix covers multiple Technologies



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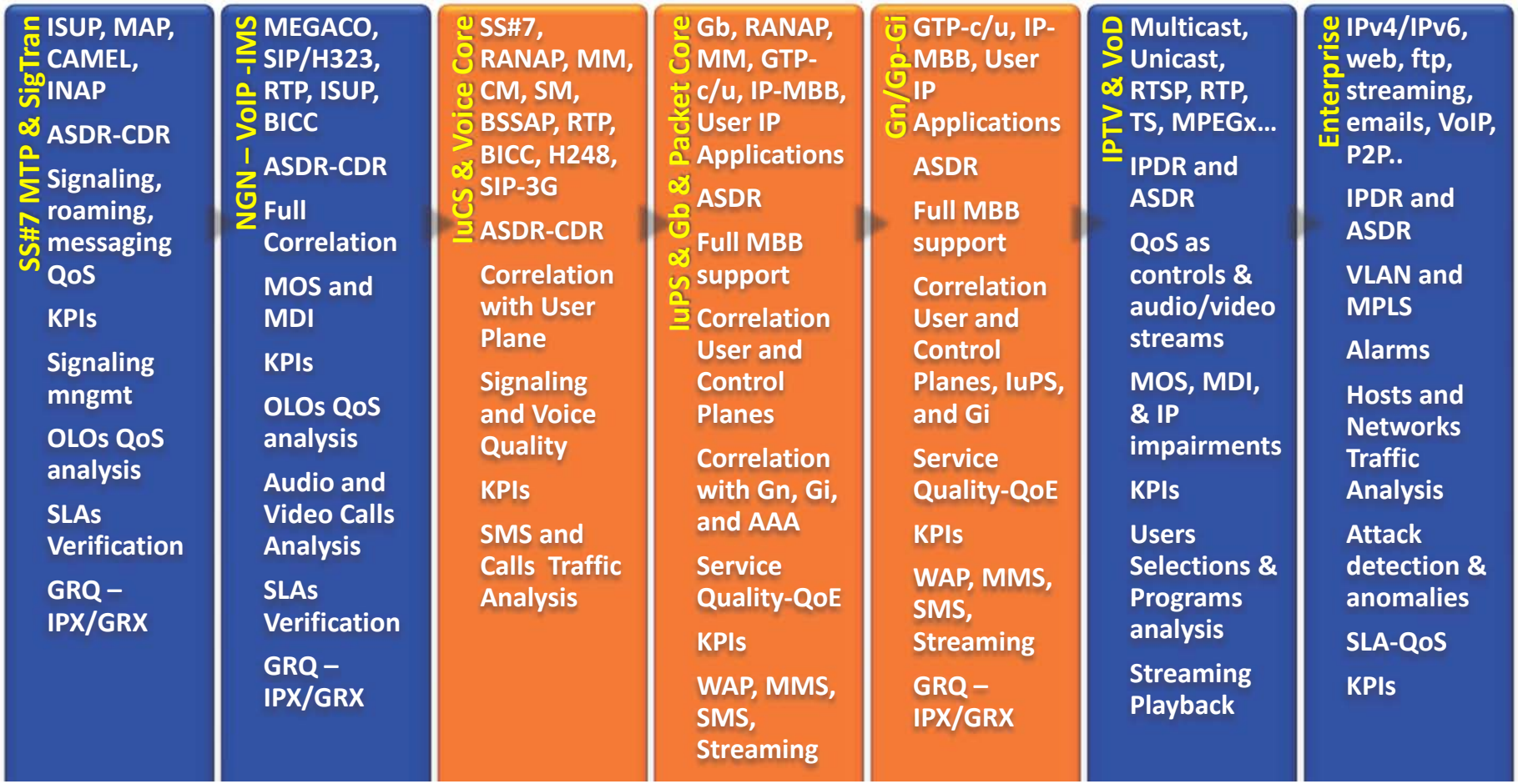
Technologies Coverage (details)



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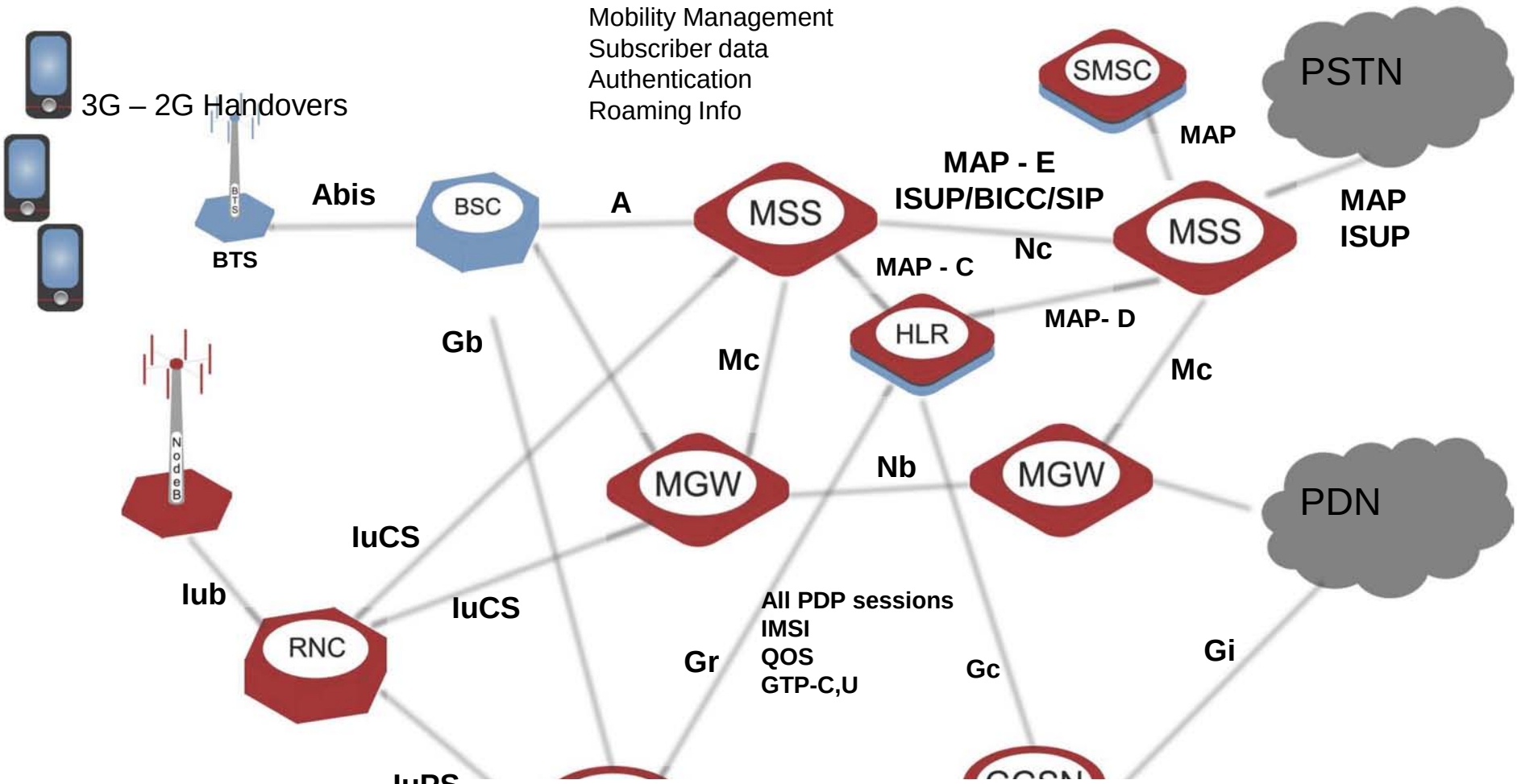
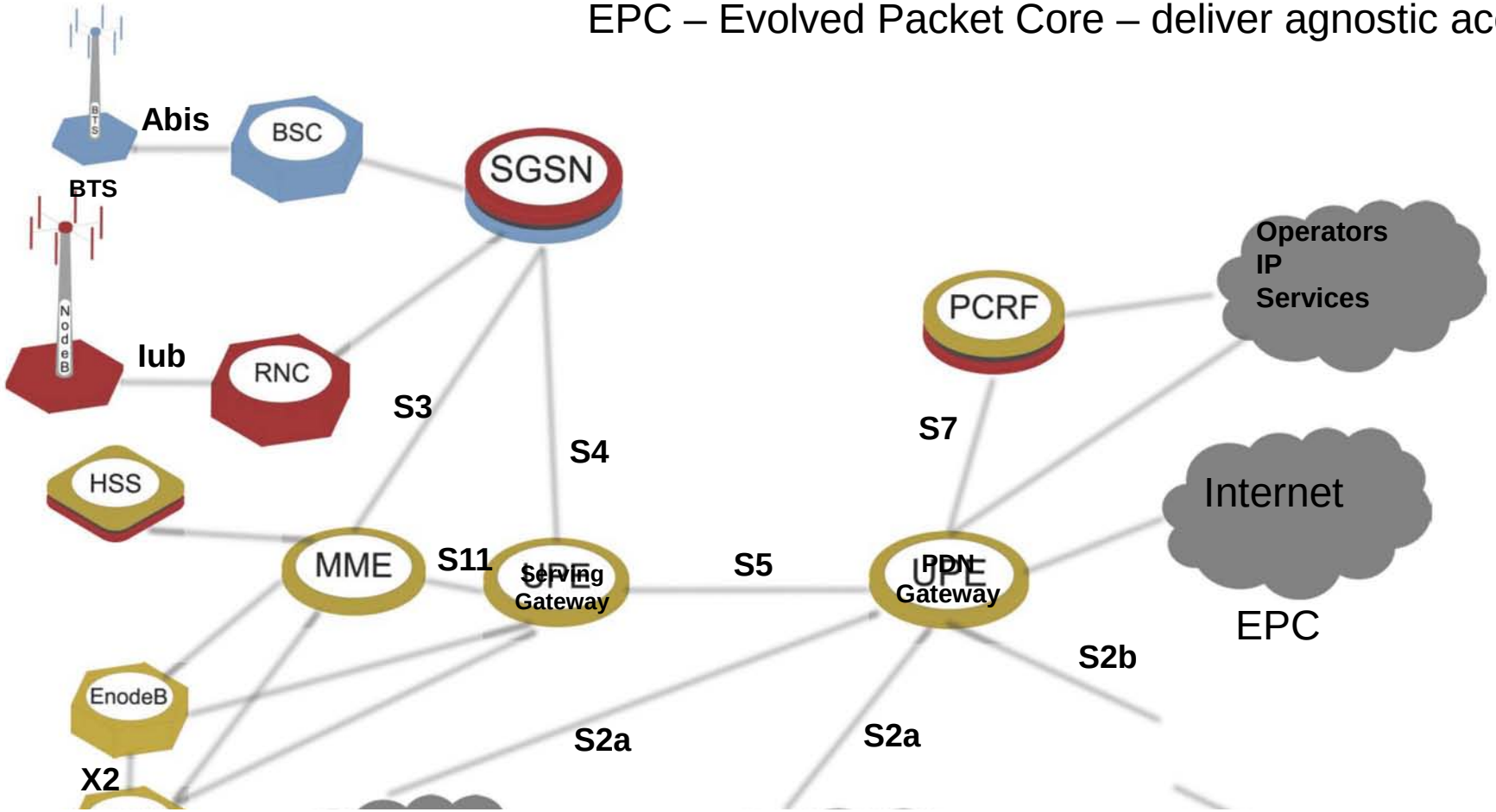
Evolution – UMTS R4 Network Architecture

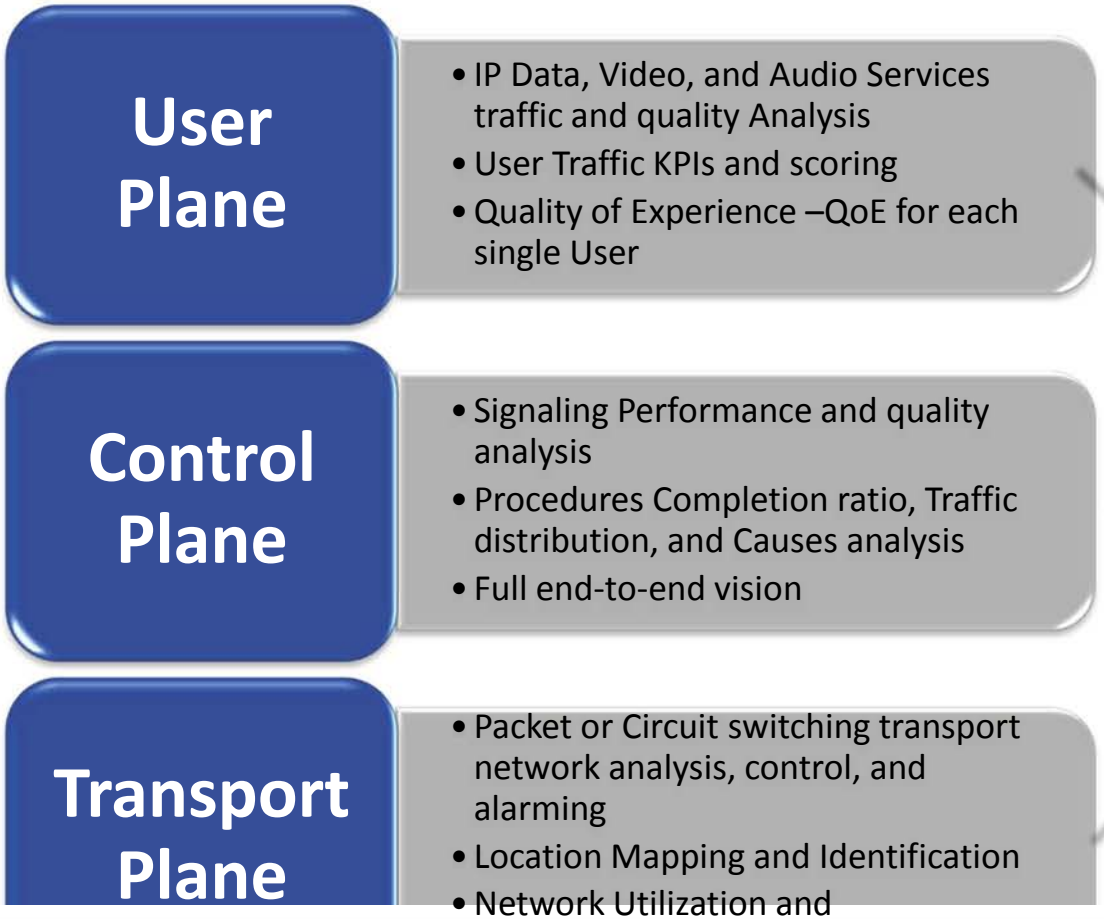


Evolution – UMTS R5/6 Network Architecture

EPC – Evolved Packet Core – deliver agnostic access



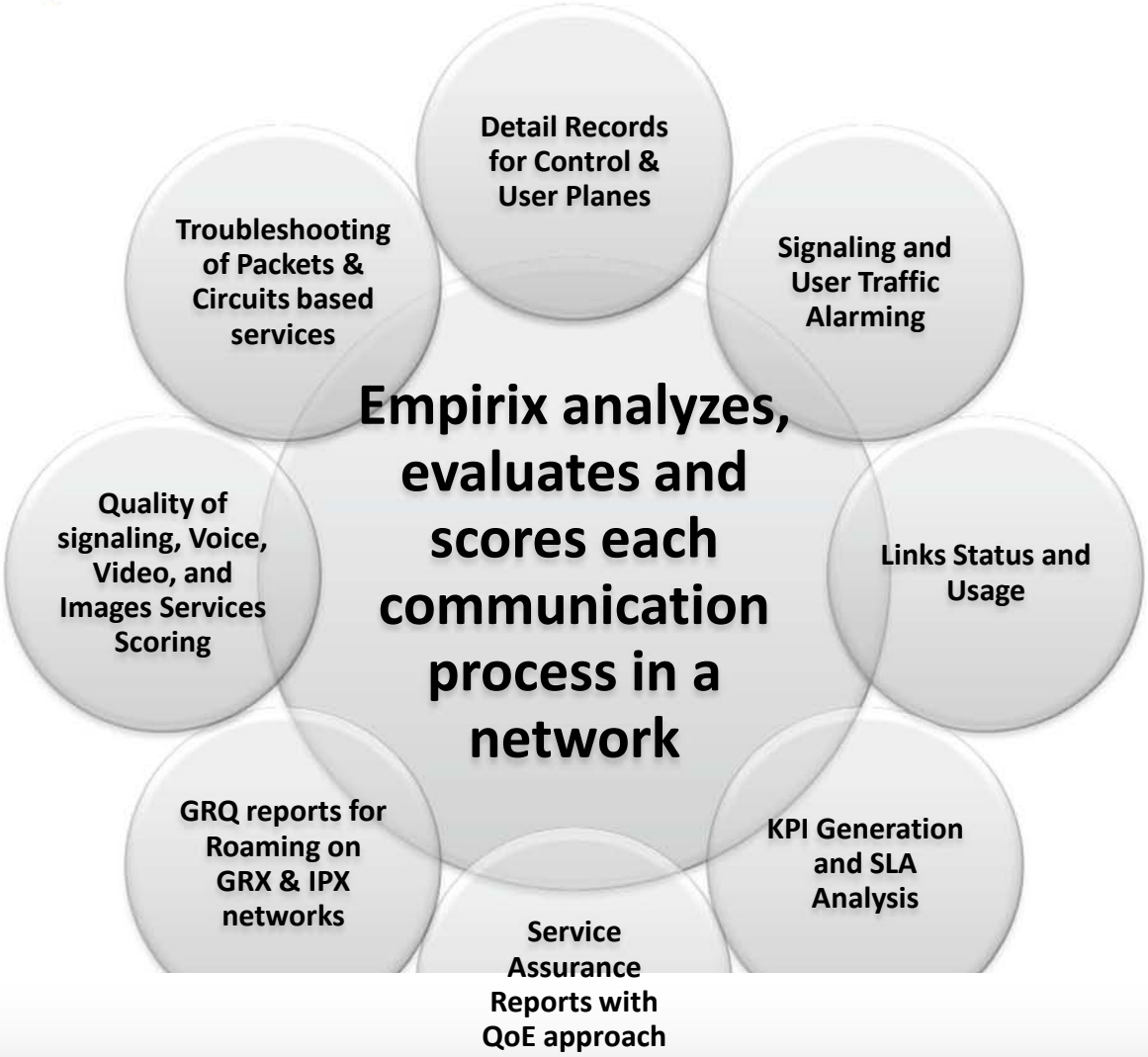
Empirix offers a single solution for all the communication processes



empirix
When Quality Matters™

Network Domains Coverage

Empirix provides critical information



Empirix Monitoring Components

- QXManager is the Centrex Application Viewer
- IPXPlorer is the probe products family for passive monitoring
- QXAgent is the software element for active testing running over the IPXPlorer or external PCs
- QXM-QoS is the measurement and provision server for active monitoring
- IPXP-NET is the products family for network tapping and grooming

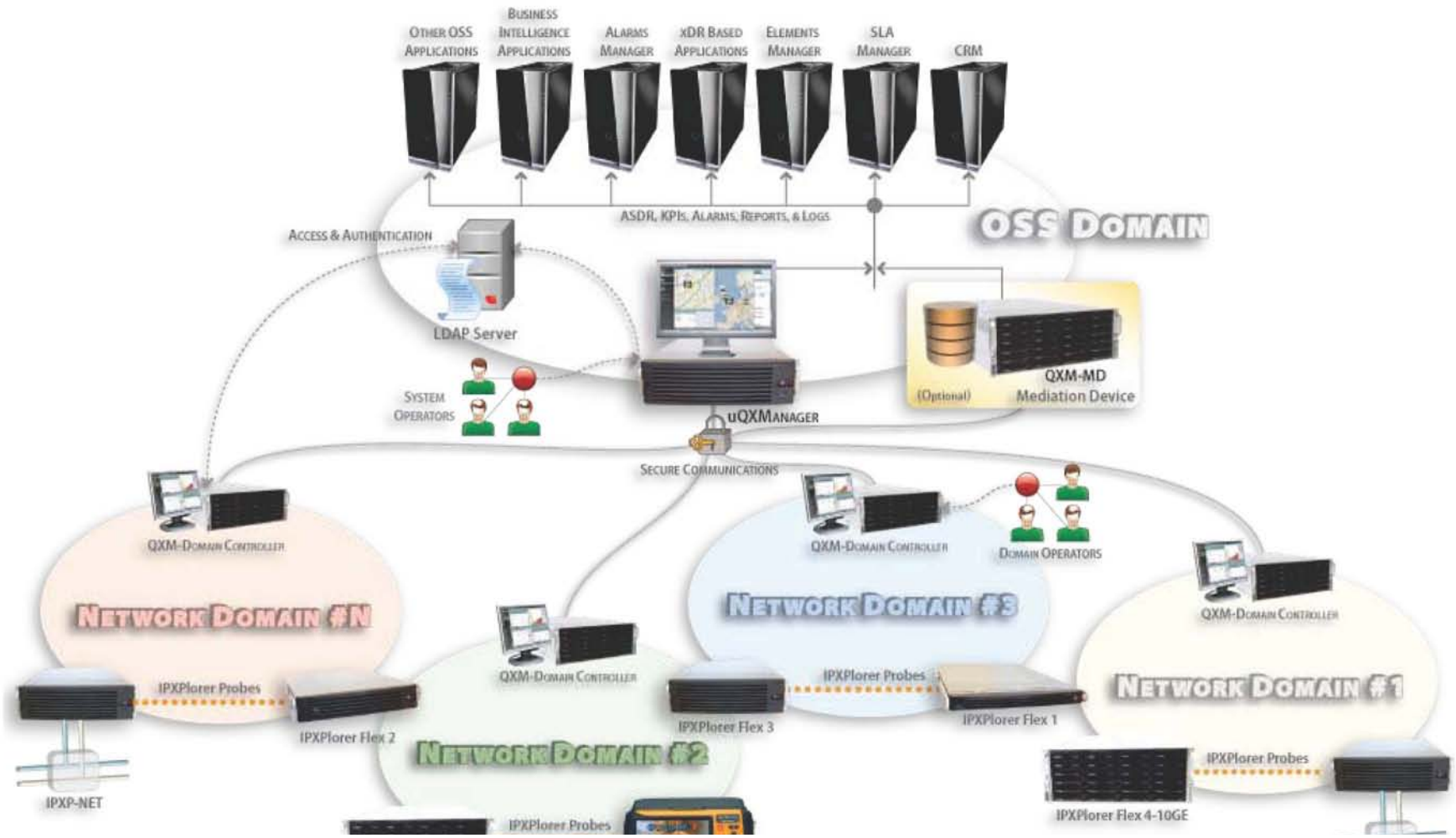
The IPXPlorer®

- It is the probe that interfaces with the monitor points then captures, filters, groups, analyzes and aggregates results per site;
- It works as stand-alone or along with µQXManager
- It delivers alarms and results by ftp, syslog, ssh, or direct database TCP connection;
- It is accessed by web-based GUI;
- It stores results, ASDR™, alarms, KPIs and raw data including packets in PCAP format on local storage;
- It delivers packets and frames when required by the Operator or by the µQXManager ;
- It is synchronized to guarantee the same frequency, phase and absolute date and time.

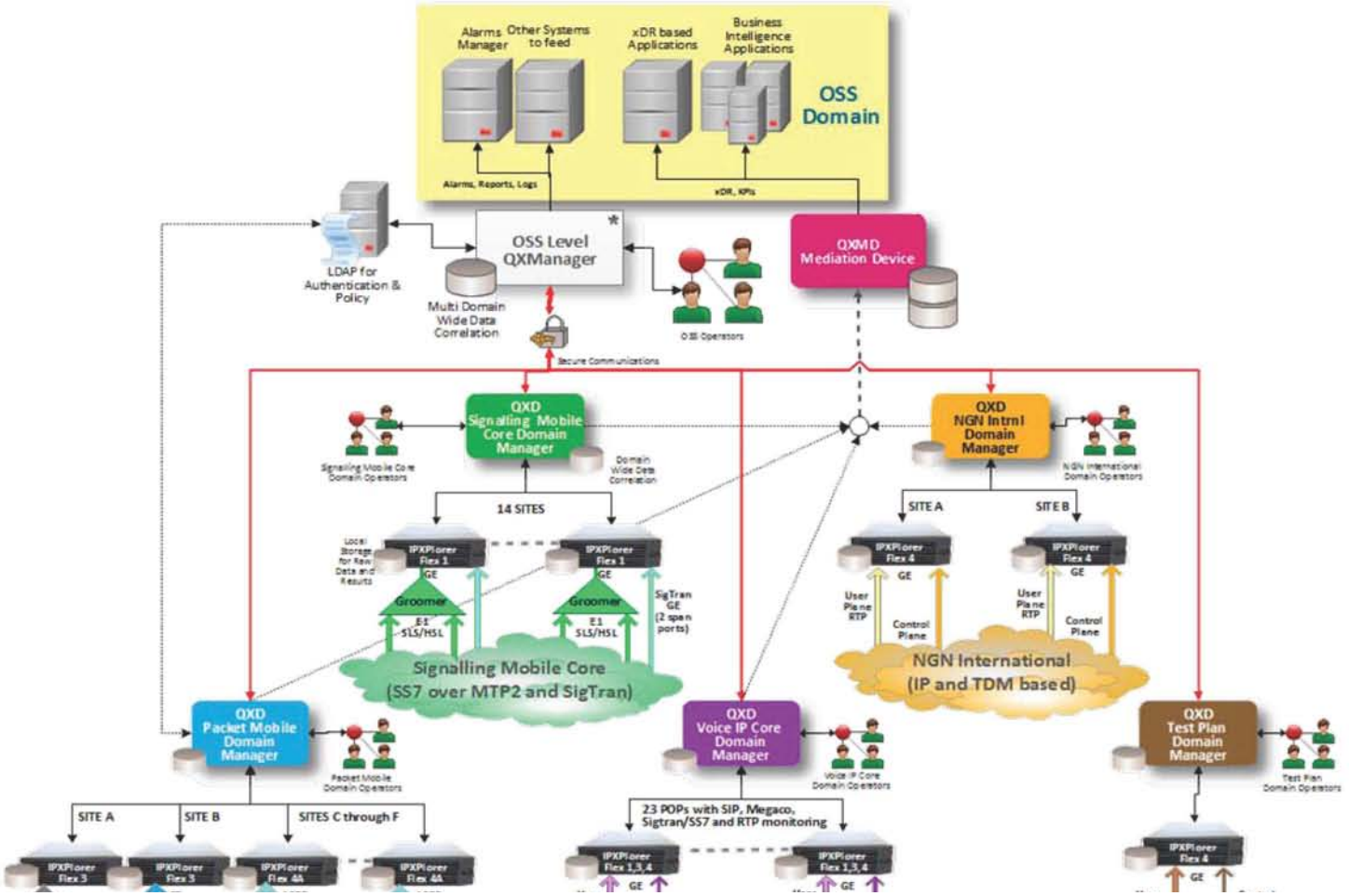
The IPXPlorer® Probe

- IPXPlorer® models:
  - IPXPlorer® One, the portable stand alone
  - IPXPlorer® Mod, the table top and rack mount
  - IPXPlorer® Two, the portable 10GE analyzer
  - IPXPlorer® Flex 1U, 2U, 3U, 4U versions for large storage and high number of interfaces

Multi-domain Architecture

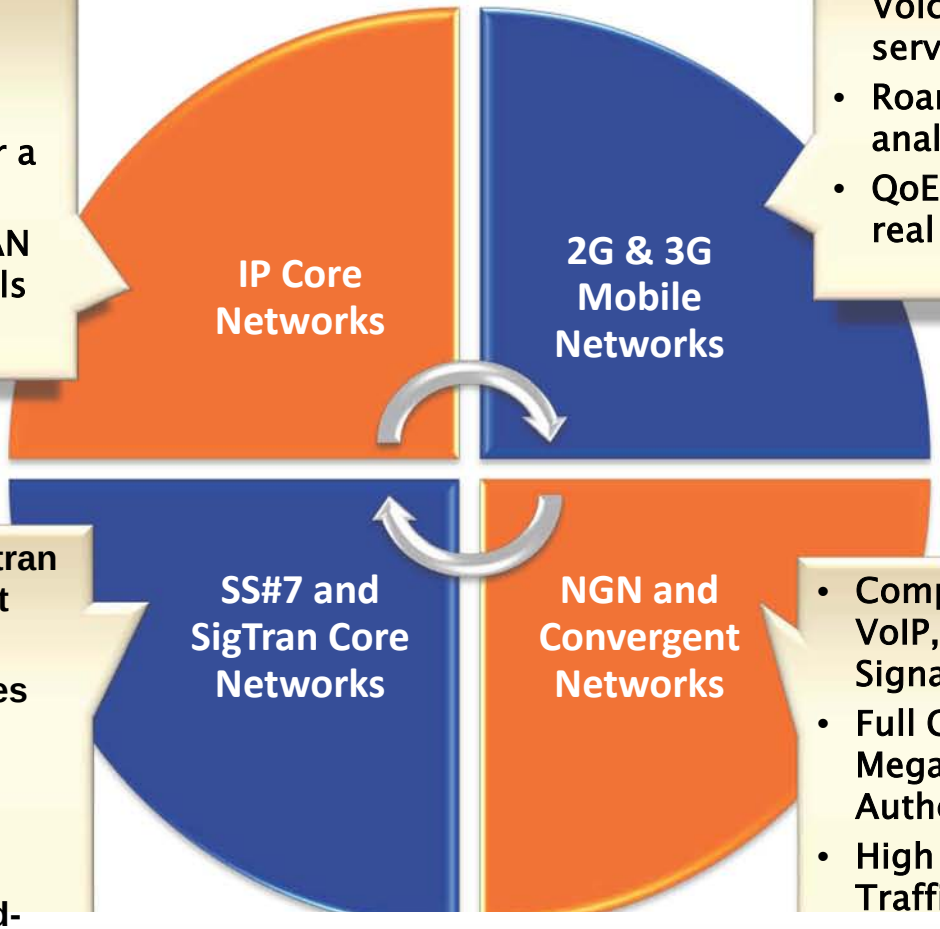


Example Project Topology



Monitoring Applications for Telecom Operators

- Full Traffic and Service analysis of any data and telecom applications over a single monitoring point
- Replace the current IP/LAN Data only monitoring tools



- Coverage of PS, CS, Core, Voice, Messaging, and Data service in single platform
- Roaming and services SLA analysis between Operators
- QoE scoring based on the real User Traffic

- Integrated circuit and Sigtran Signalling system support
- Correlation and SigFlow views between the services such as ISUP, MAP, CAP, INAP, ISDN
- Built-in OLOs Traffic and Quality Analysis
- Replace the traditional old-style SS#7 Analyzers

- Comprehsive analysis of VoIP, IMS, Media, Trunk and Signalling Gateways
- Full Correlation bewteen SIP, Megaco, SS#7, RTP and Authentication
- High Volume and density Traffic support
- MOS and MDI analysis

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Empirix Monitors a Broad Range of Data

- **Customer Information**
  - Subscriber identification
  - Cable Infrastructure
- **Call characteristics**
  - Success or Failure status
  - Call length
  - PDD
  - Connect Latency
  - MOU
- **Media Quality Statistics**
  - Jitter
  - Latency
  - Packets Lost
  - R-factor
  - MOS
  - 1-way audio
  - Burst/Gap
  - Inter-arrival analysis
- **Network Topology**
  - Nodes
  - Paths
  - Links
- **IMS Methods**
  - MWI
- **IMS Transactions**
  - REGISTERS
  - NOTIFY
  - OPTIONs
  - INVITES
  - …
- **Regional System Statistics**
  - Top Callers
  - Regional metrics
  - Defects per Million
  - Minutes of Use
  - BHCA
- **Error Information**
  - By Type
  - By Code
- **Time based information**
  - Frequency
  - When things happen

The KPIs

- Empirix provides over 3500 KPIs including:
  - IP impairments such as network response time, latency, jitter, packet loss, duplication, and retransmission, fragmentation level…
  - Generic Applications impairments such as application response time, traffic figures per direction, retransmissions, speed in uplink & downlink….
  - Specific Service impairments and performance such as session established, released and duration time, real User perceived speed, QoS scoring, telephony type analysis (ASR, ABR, Call attempts etc)…
  - Inter-Protocol and inter-Site correlation impairments such as transit delay, message loss, overhead, efficiency, speed bottlenecks, QoS effectiveness ….

Application & Services KPIs provided

- KPIs for overal Application and services:
  - KPIs IP -> DNS, WEB, MAIL (POP3, IMAP, SMTP), RADIUS, DIAMETER, PPPoE/DHCP, P2P, CHAT
  -
  - KPIs IP Multimedia: IPTV (Multicast and Unicast) and VoD (RTSP and HTTP based)
  - KPIs IP MESSAGING -> MMS, SMS, WAP
  - KPIs VoIP and NGN -> SIP, H323, RTP/RTCP, H248, MGCP, BICC
  - KPIs GnGp-> All the KPIs IP, KPIs IP Multimedia, and KPIs IP MESSAGING for User Plane Traffic
  - KPIs IuPS UP-> All the KPIs IP, KPIs IP Multimedia, and KPIs IP MESSAGING for User Plane Traffic
  - KPIs SS7-> IuCS, ISUP, BICC, SIP-I, MAP, CAMEL, INAP, Gsm-A

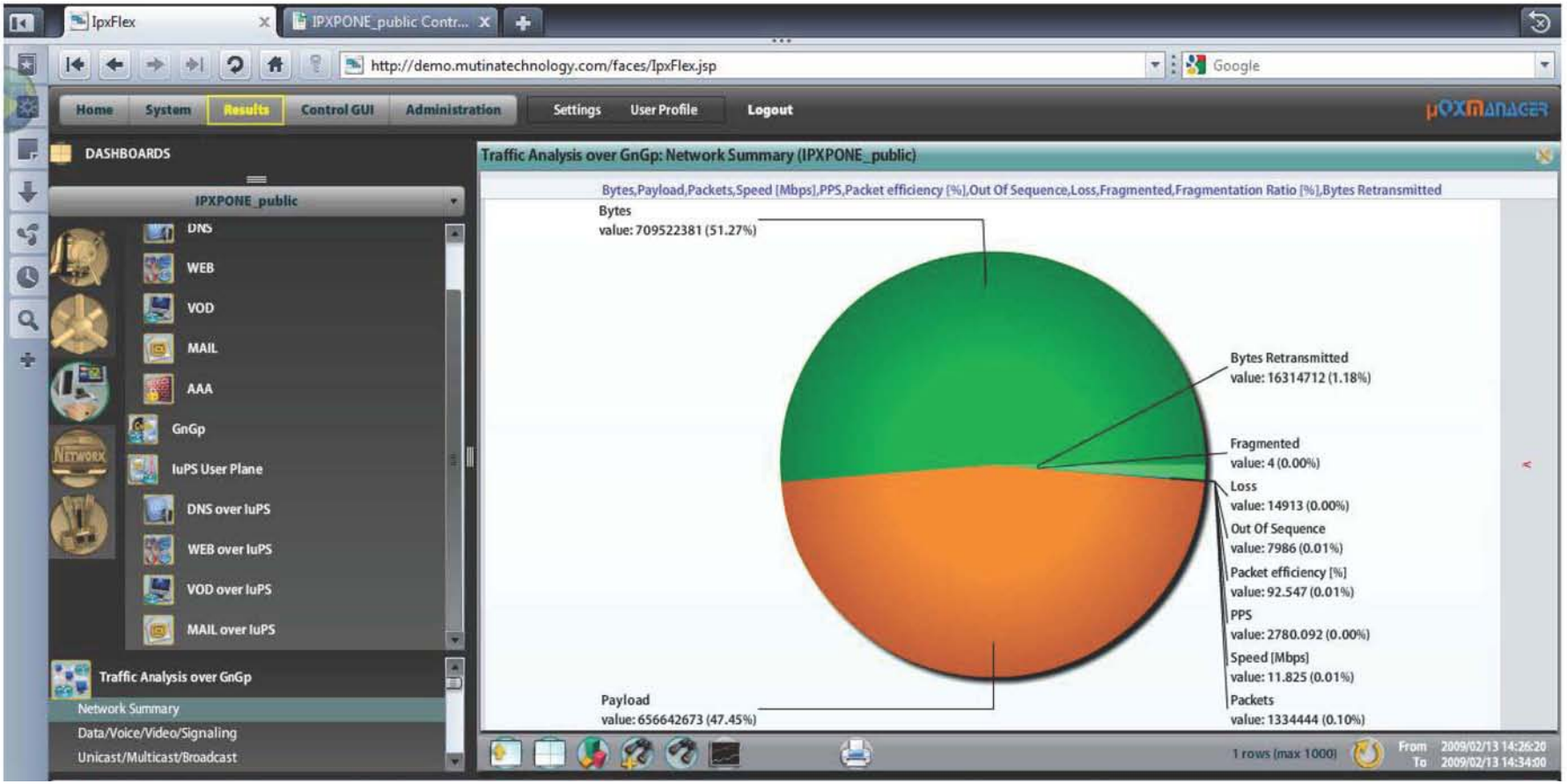
Multimedia KPIs – RTSP/VoD

- RTSP
  - Top N Clients
  - Top N Servers
  - Top N URL
  - Session
  - Methods
  - Transactions
  - Failure Cause
- Response Time
  - Worst response time by (server, client)
  - Best response time by(server, client)
  - Session Setup time
  - Worst session setup time by (server, client)
  - Best session setup time by(server, client)
- QoS Analysis
  - MOS-MDI Stream Analysis
  - MOS-MDI Analysis by Codec
  - MOS-MDI Origin Host
  - MOS_MDI Destination Host
  - Stream Impairments
- Traffic Analysis
  - Most Active RTP Streams
  - Best Video Quality Stream
  - Best Audio Quality Stream
  - Worst Video Quality Stream
  - Worst Audio Quality Stream
- MPEG2 Transport Stream
  - PID table
  - Transport Stream throughput
  - ETR290 Performance Class
  - Program QoS
- ASDR
  - RTSP details Record
  - MPEG2 TS PID Details Record&QoS
  - MPEG2 TS Details record
  - RTP Details Record with QoS

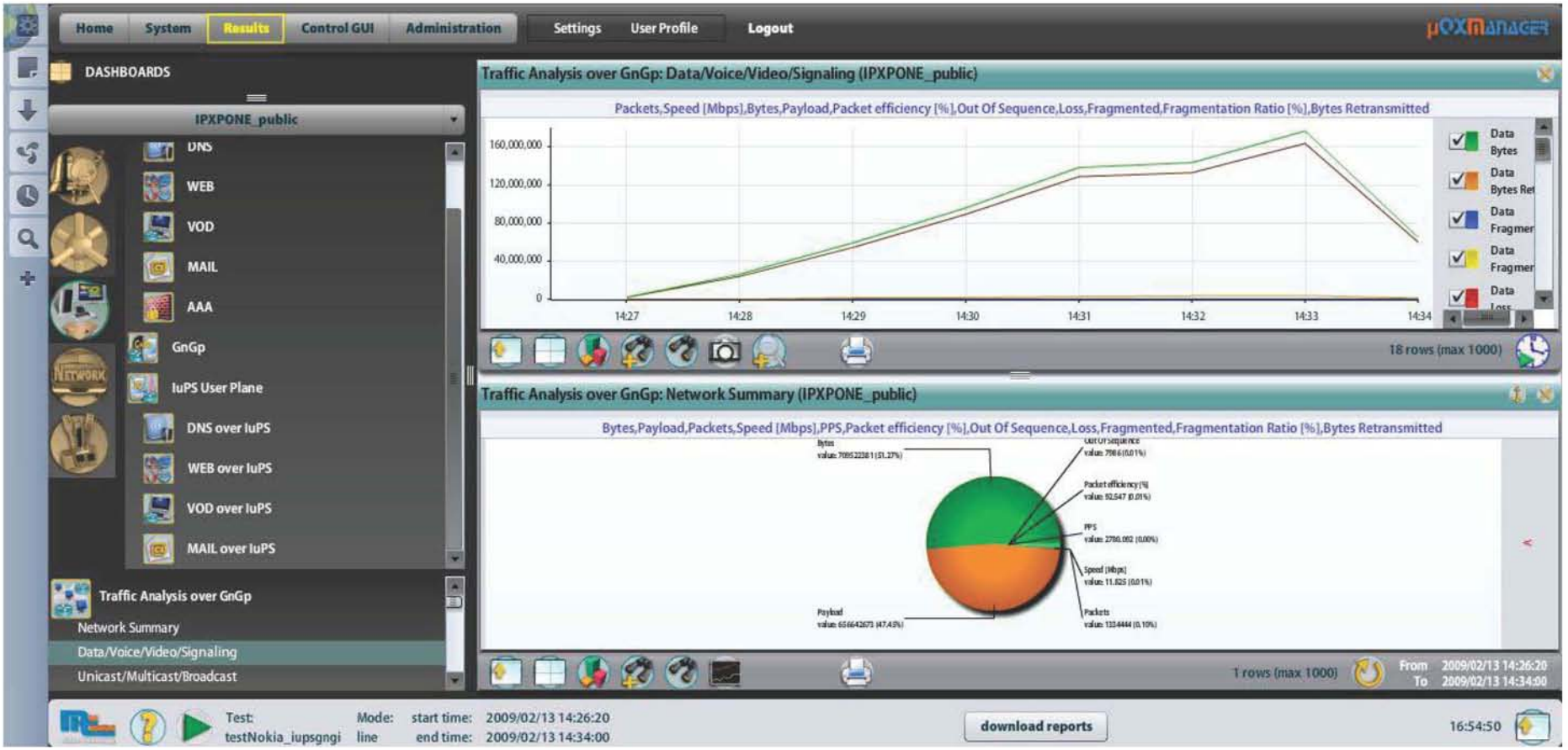
GnGp – Control Plane KPIs

- Traffic analysis over GnGp
  - Network Summary
  - Data/Voice/Video/Signaling
  - Unìcast Multicast/Broadcast
  - Packet impairments
  - Fastest Network Response
  - Slowest Network Response
- IP Host Pairs over GnGp
  - Pairs list
  - Traffic Volume: Top N
  - Data Traffic Top N
  - Voice Traffic Top N
- IP Host over GnGp
  - IP Addresses list
  - Traffic Volume: Top N
  - Retransmission Top N
  - Fragmentation Top N
  - Out of Sequence Top N
  - Traffic by application Top N
- IMSI
  - List
  - By application
- IMEI TAC
  - List
  - By application
- RAT
  - Packet impairments
  - Application over GnGp
  - Application list
  - Traffic by application Top N
  - Fastest Application Report time
  - Slowest Application Report
- Transport over GnGp
  - Transport summary
- ASDR
  - IPDR over GnGp

GnGp KPI Examples- Traffic Analysis



GnGp KPI Examples – Multimedia Analysis



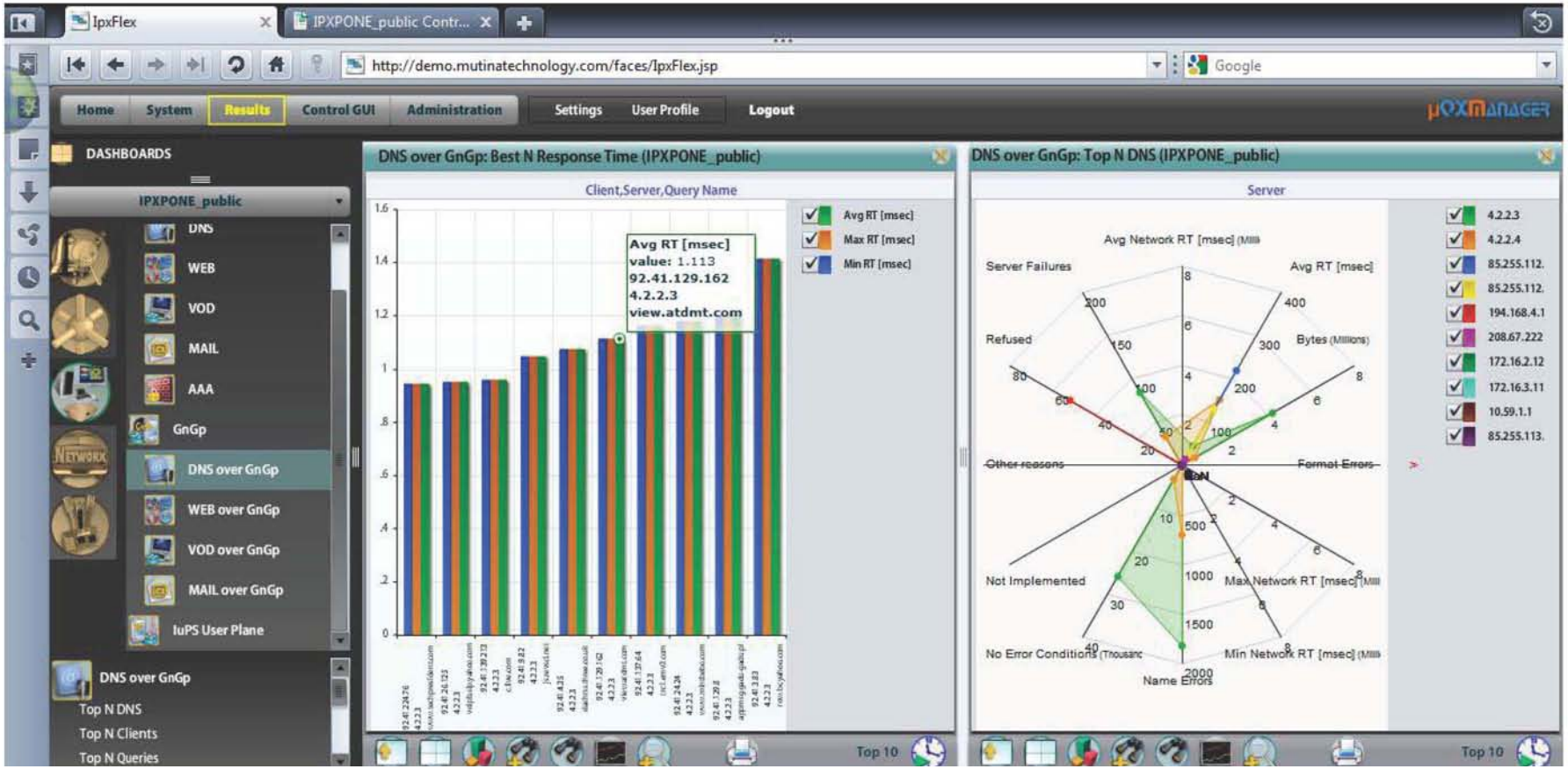
GnGp Application and services KPIs (DNS/WEB)

DNS over GnGp

WEB over GnGp

Response Summary

GnGp Application and services KPIs - DNS



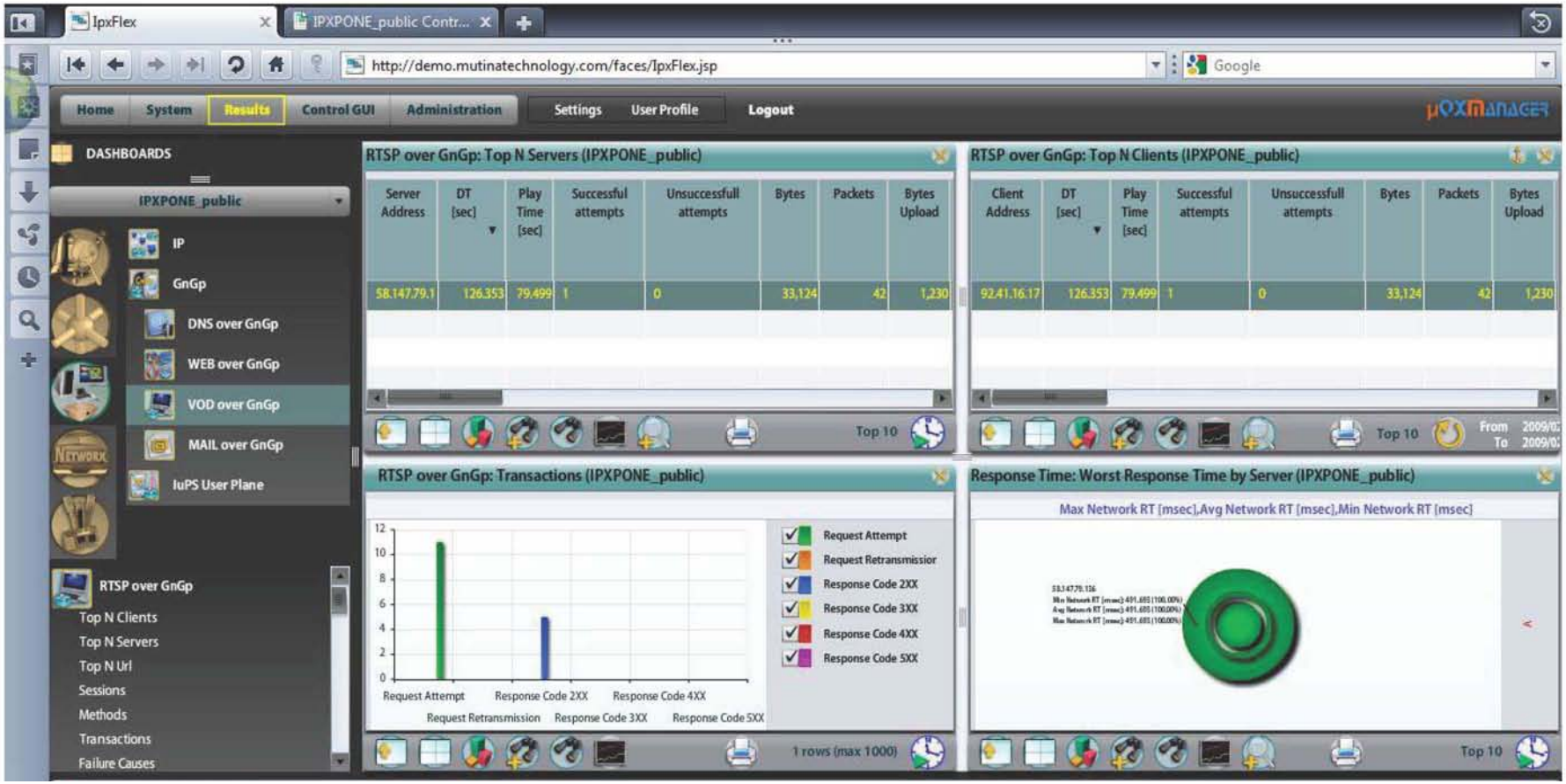
GnGp Application and services KPIs
- Server Response Time

GnGp Application and services KPIs (VOD)

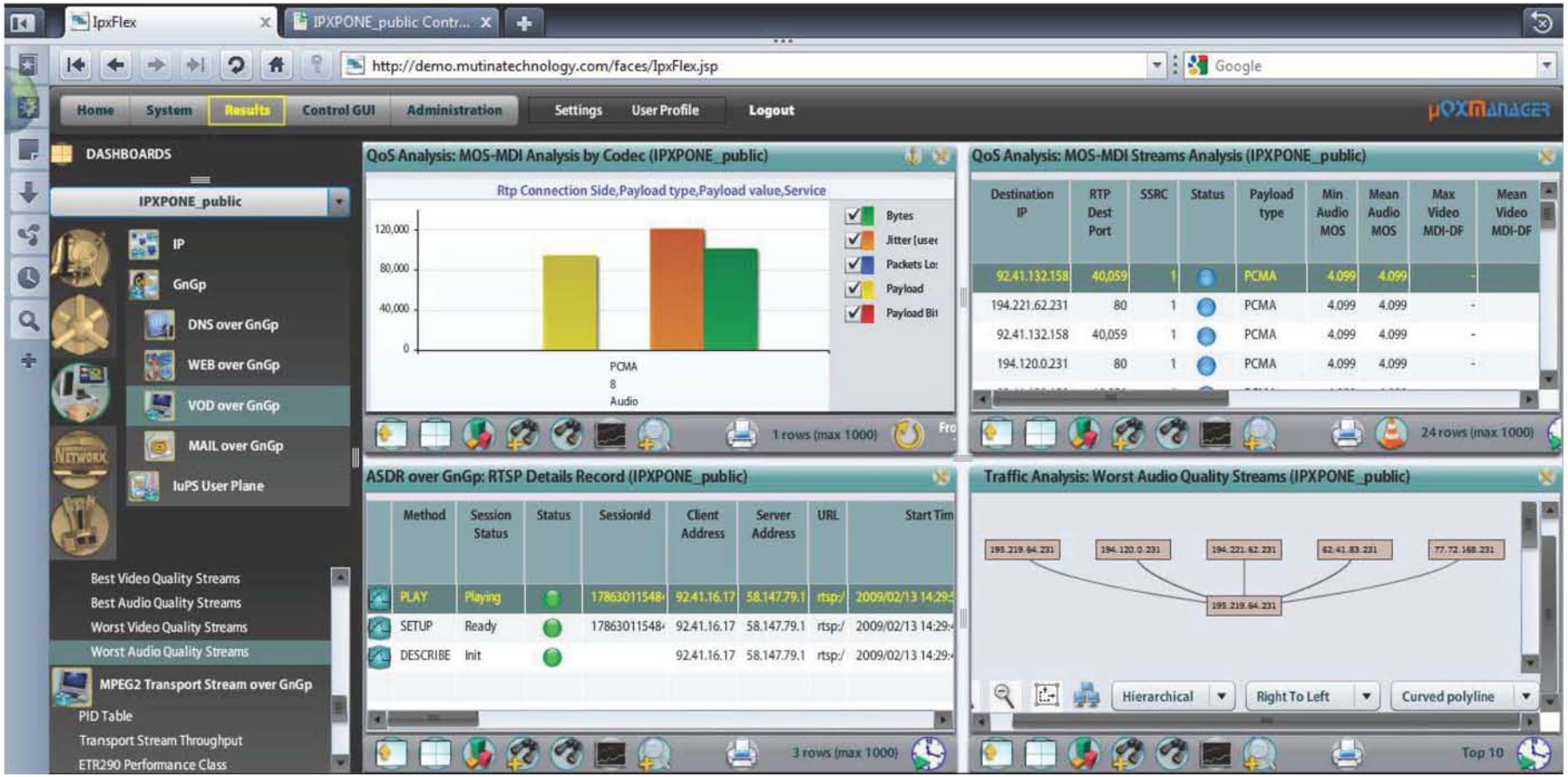
VOD over GnGp

GnGp Application and services - RTSP

GnGP Application and services KPIs - RTSP transactions



GnGp Application and services KPIs - QoS

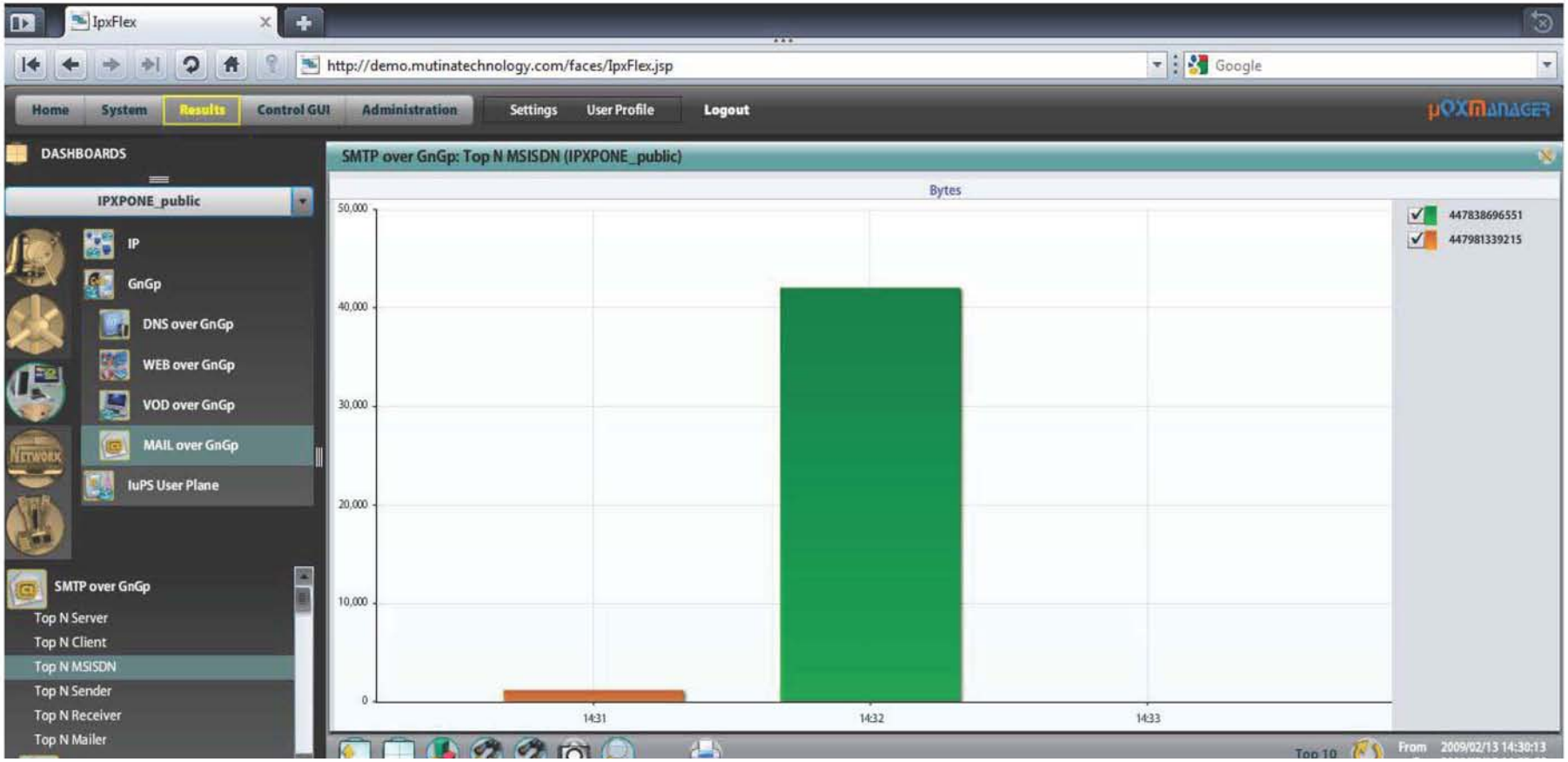


GnGp Application and services KPIs (MAIL)

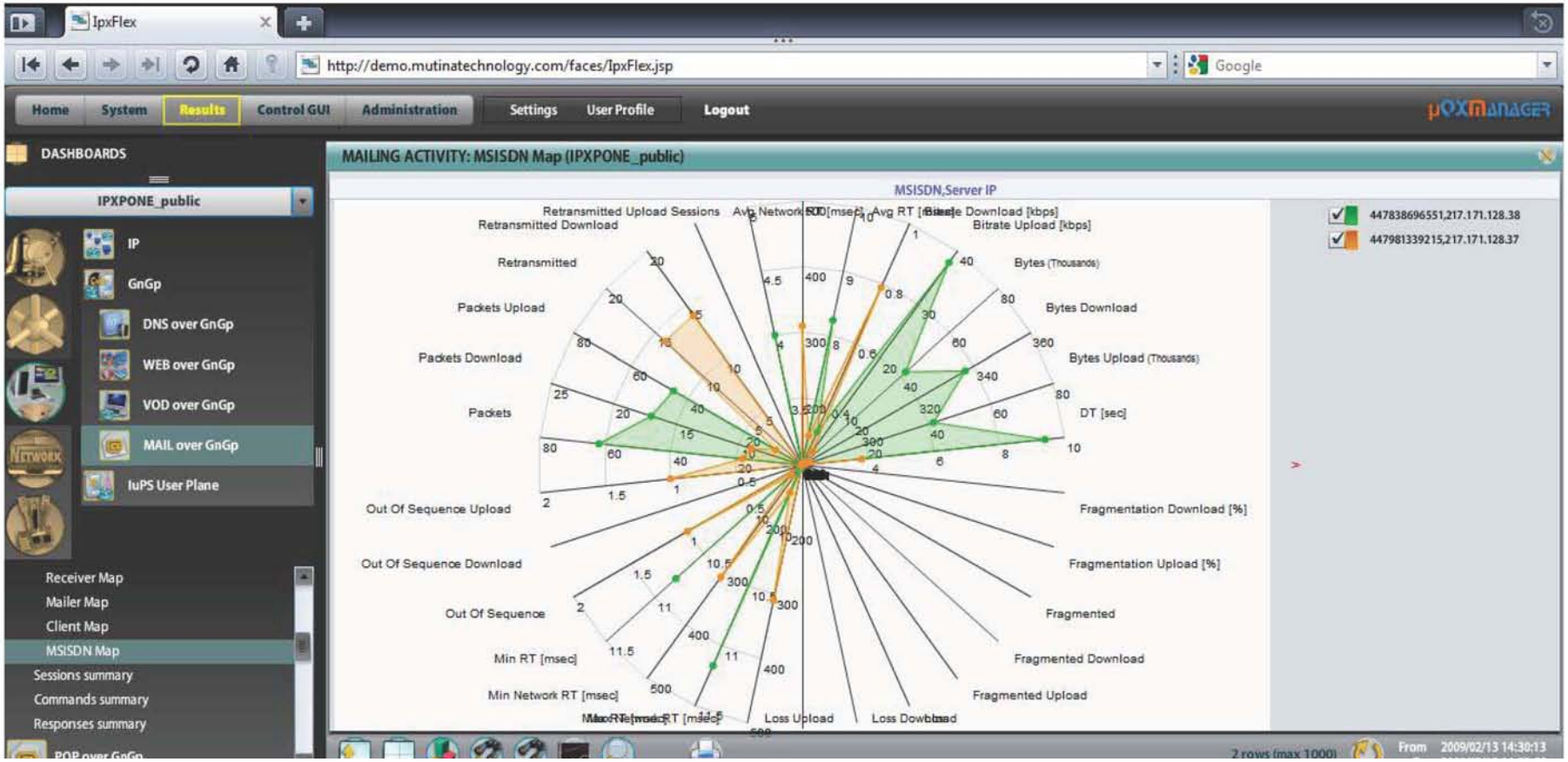
MAIL over GnGp

POP Details Record
IMAP Details Record

GnGp Application and services KPIs - SMTP



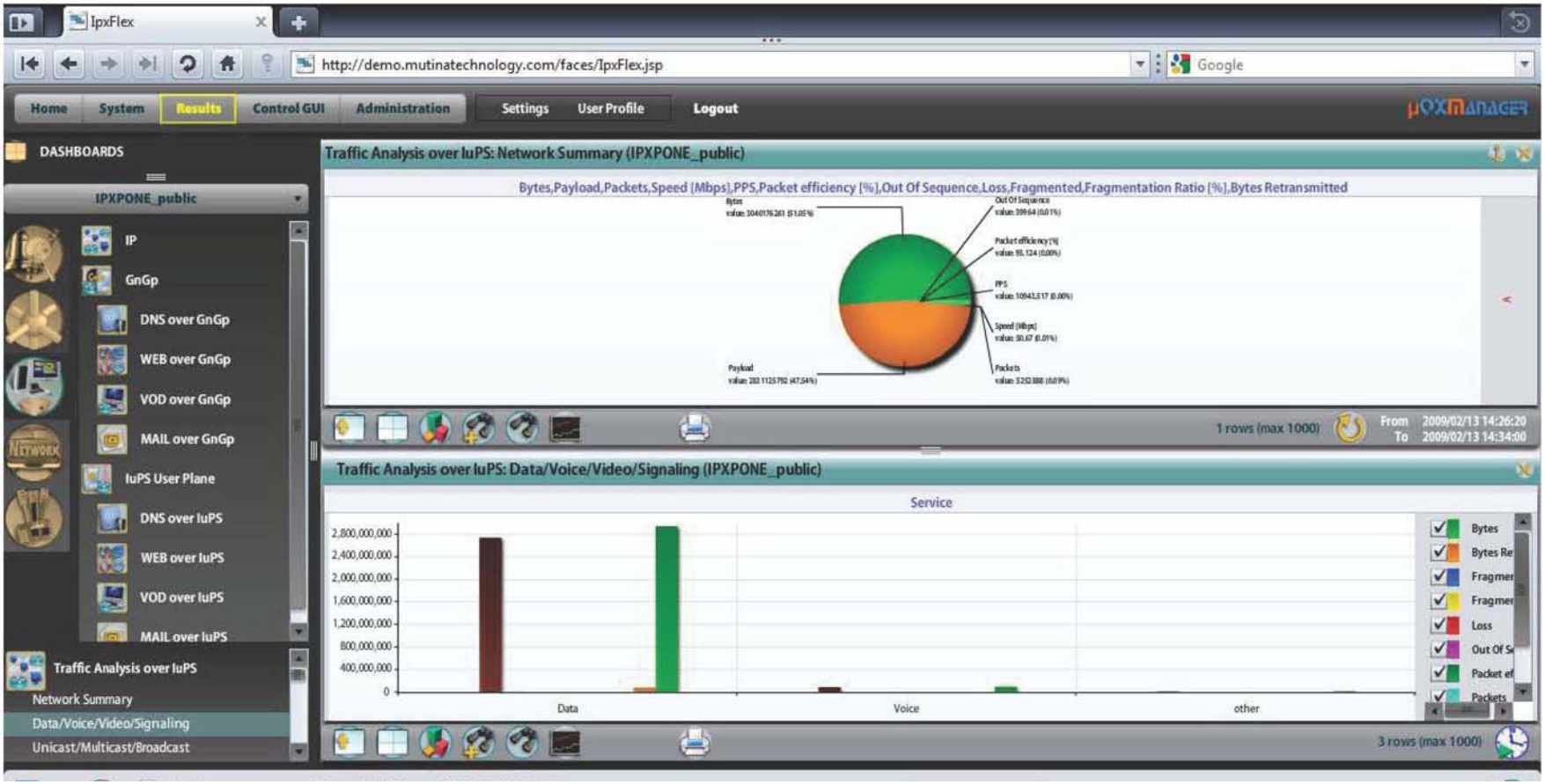
GnGp Application and services KPIs - Activity



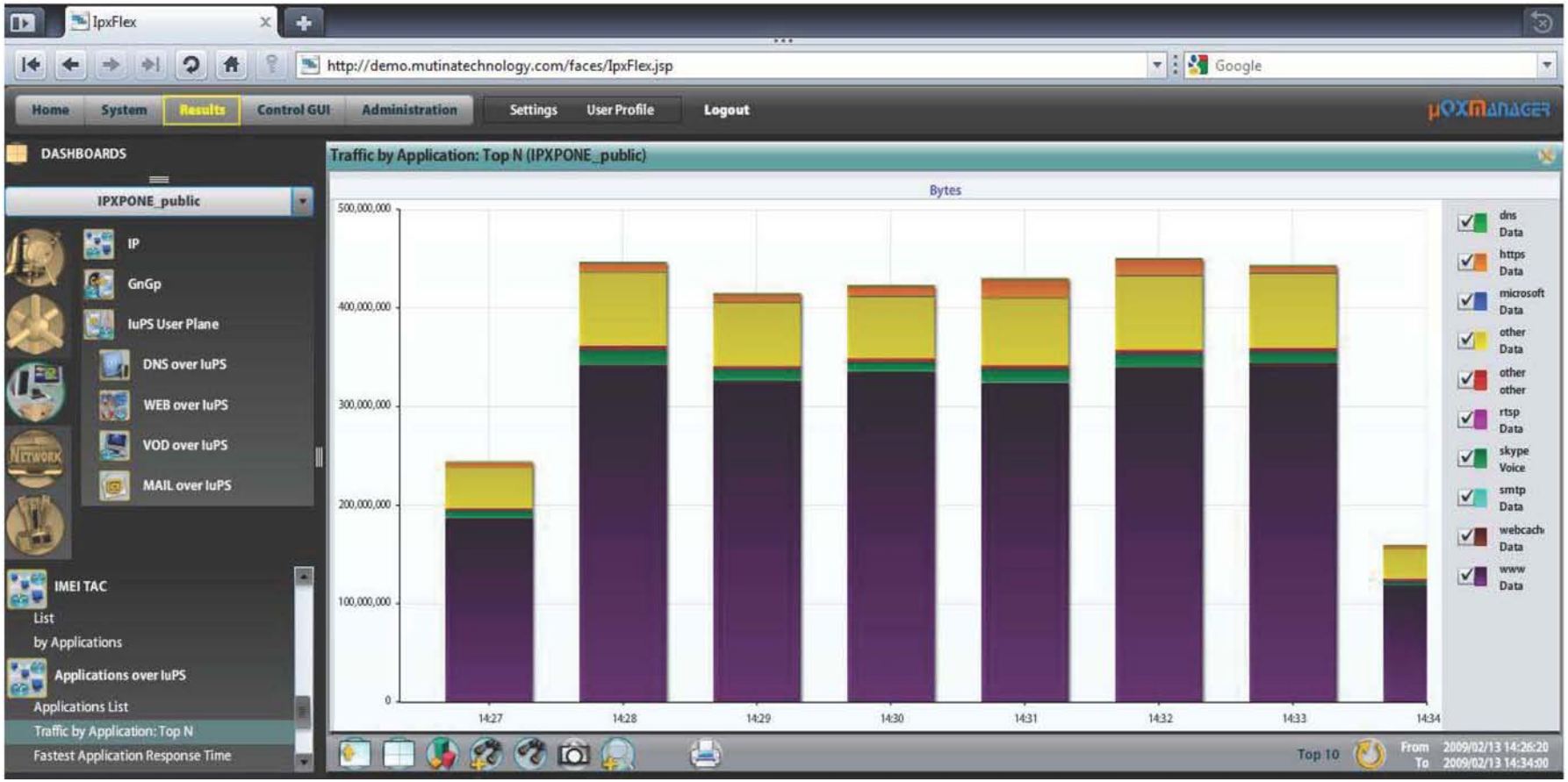
IuPS Application and Services KPIs

IuPS User Plane

IuPS Application and services KPIs - multimedia



IuPS Application and services KPIs -Traffic/application



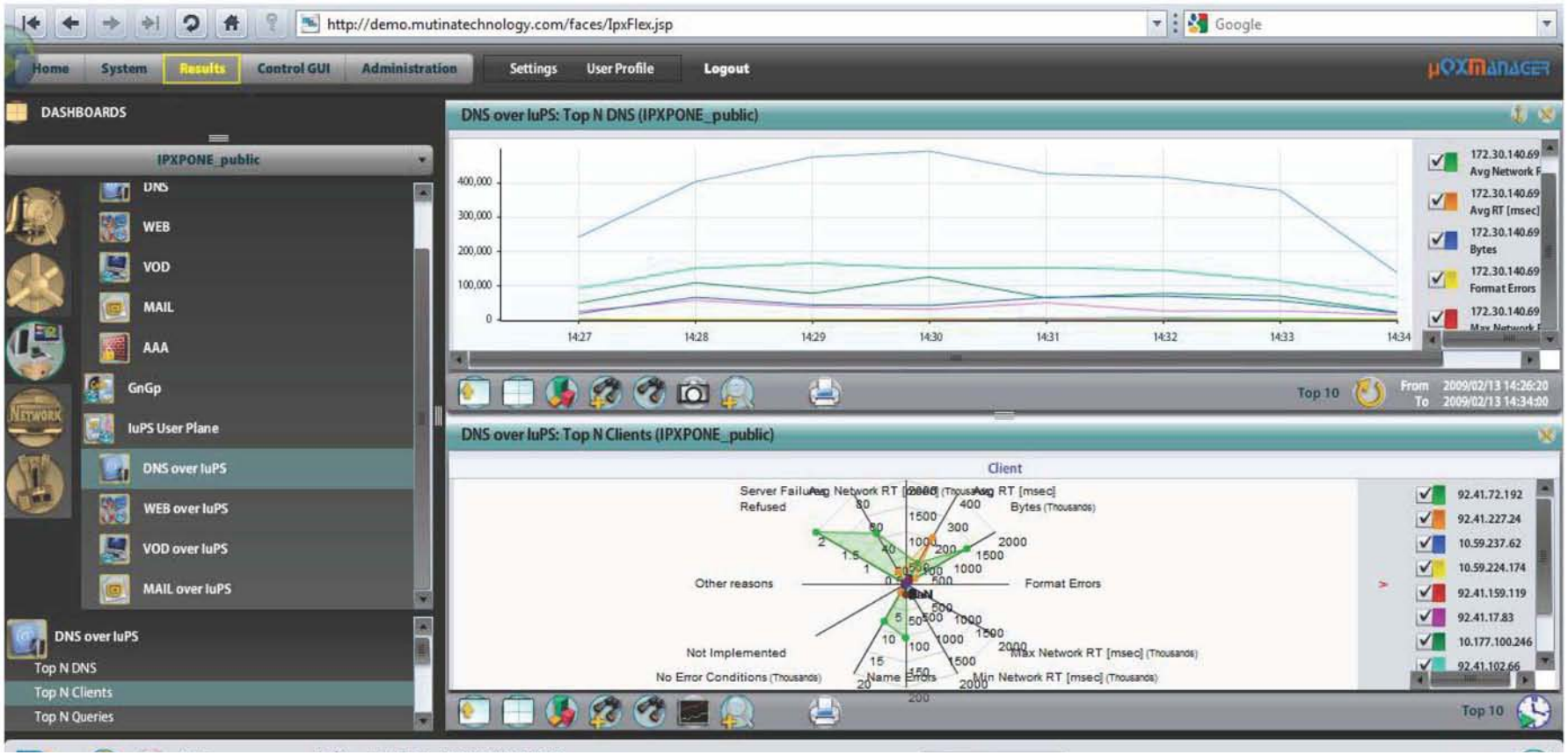
IuPS Application and services KIPs (DNS/WEB)

DNS over IuPS

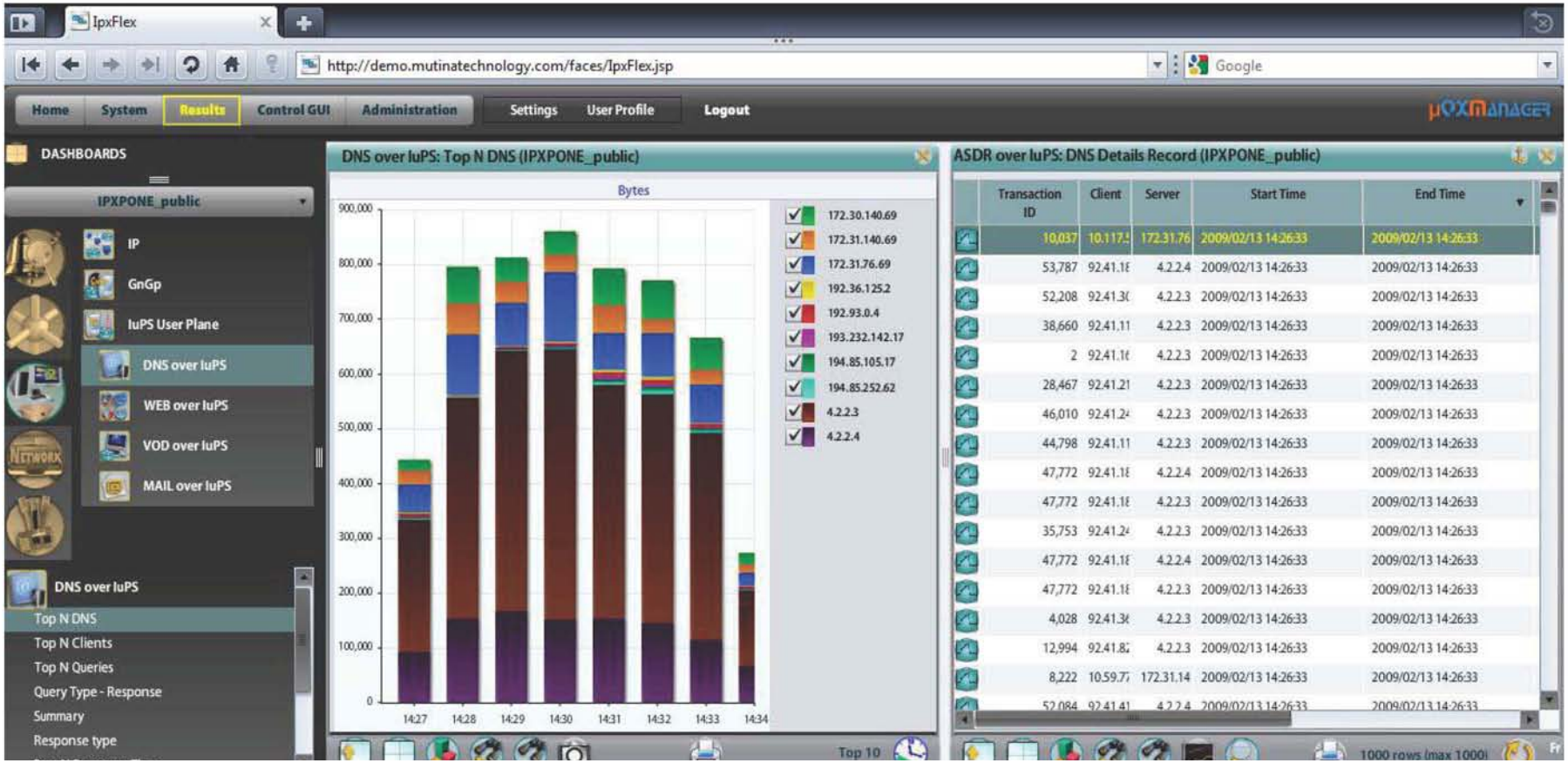
WEB over IuPS

Response Summary

IuPS Application and services KPIs – DNS Top N



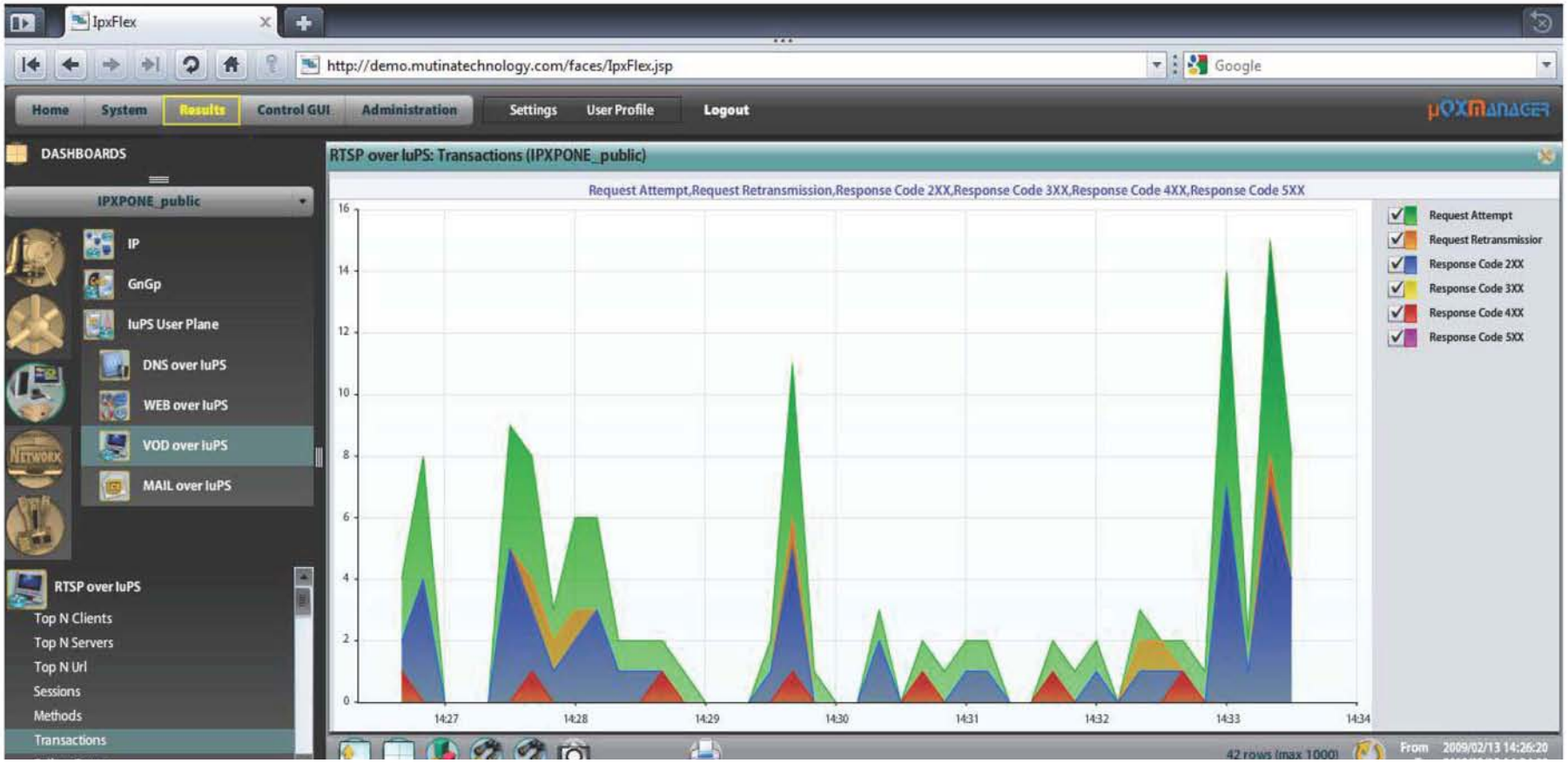
IuPS Application and services KPIs - DNS details by Top N user



IuPS Application and services KPIs (VOD)

VOD over IuPS

IuPS Application and services KPIs – RTSP Trans.



IuPS Application and services KPIs - Response Time

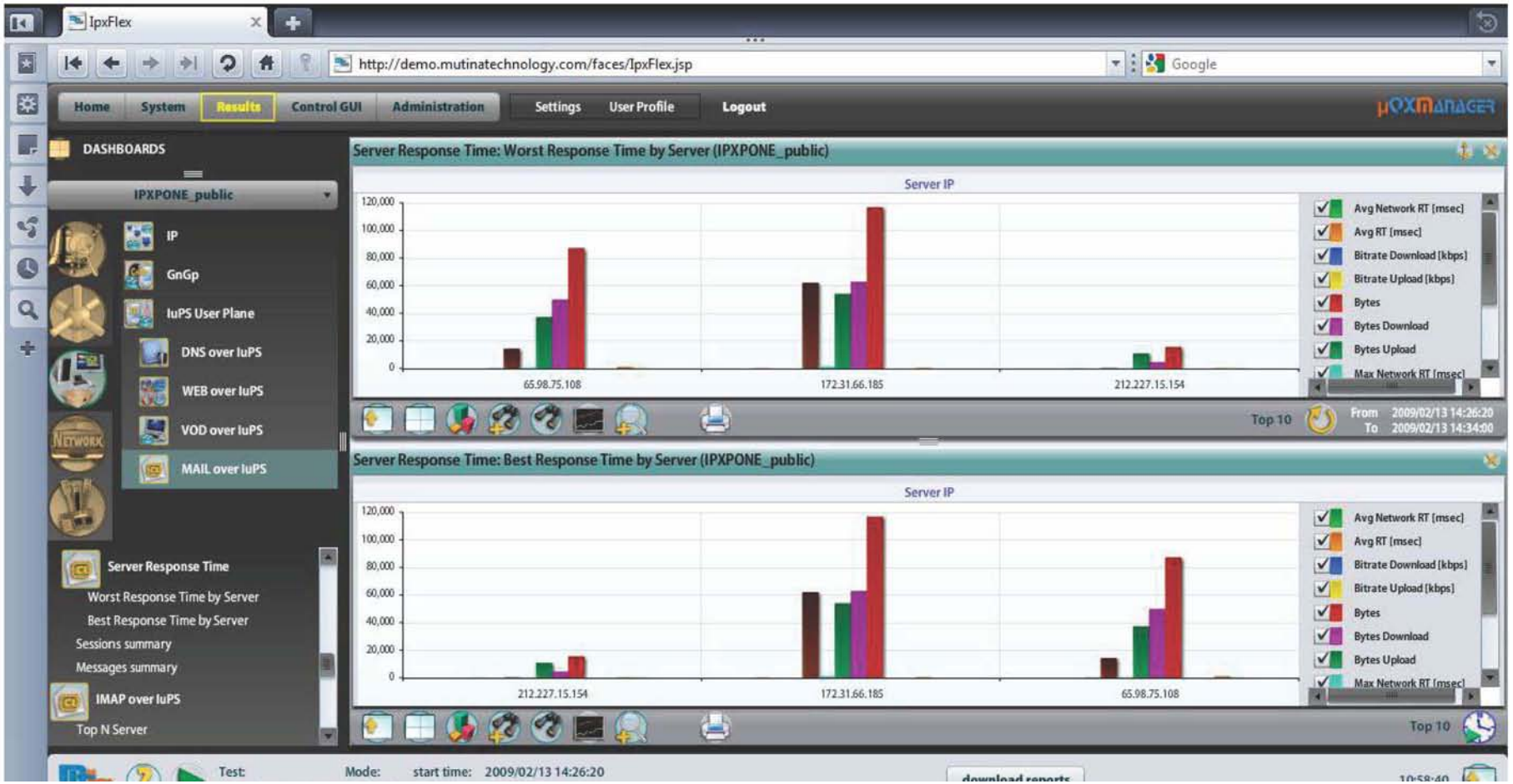
IuPS Application and services KPIs (Mail)

MAIL over IuPS

IMAP Details Record

IuPS Application and services KPIs -IMAP

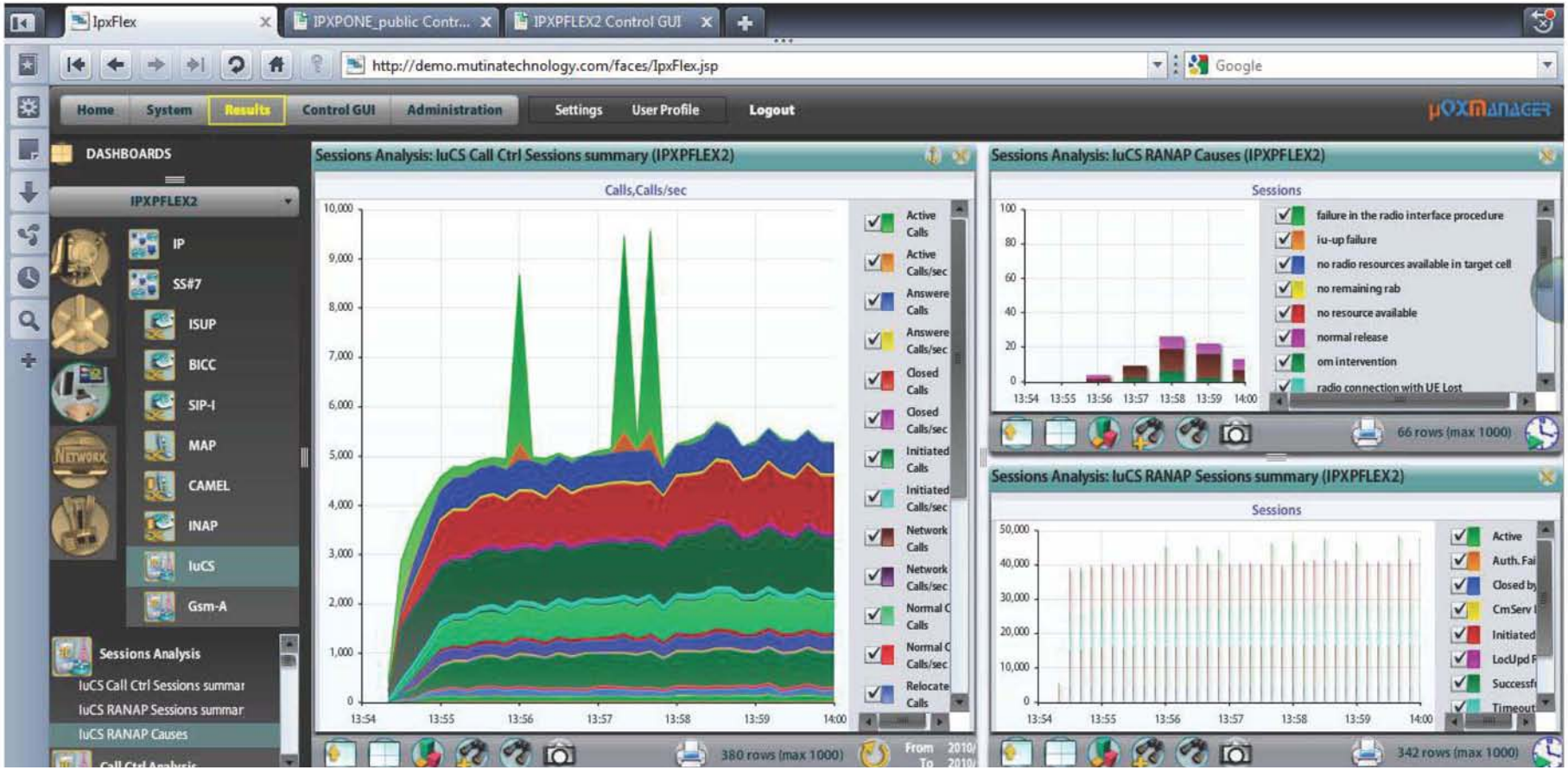
IuPS Application and services - Best/Worst response Time



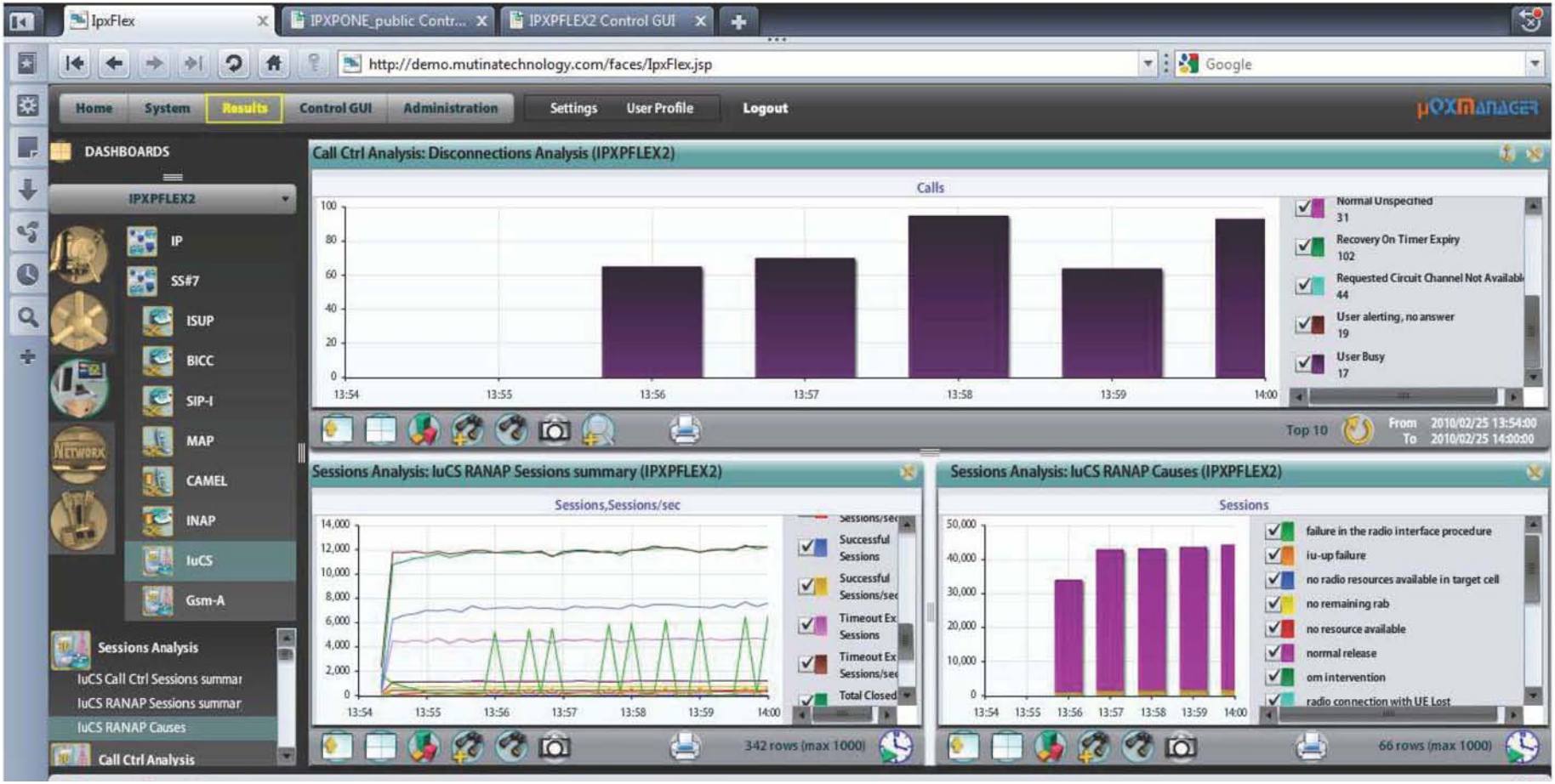
SS7 Application and services KPIs (IuCS)

IuCS

SS7 Application and services KPIs - Session Analysis



SS7 Application and services KPIs - Disconnect Analysis



SS7 Application and services KPIs - Top N Calling/Call Quality

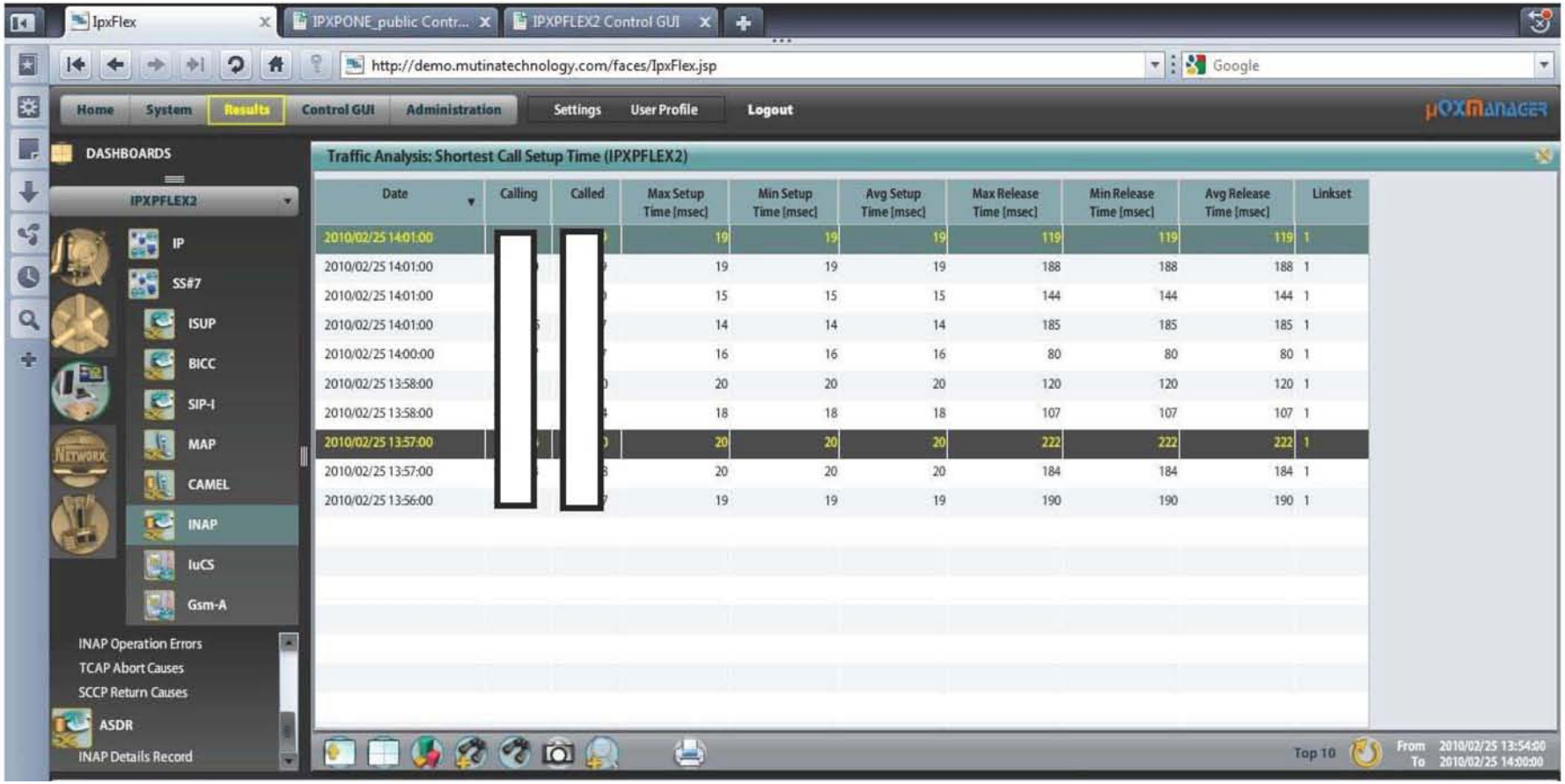
SS7 Application and services KPIs (ISUP)

ISUP

GRQ Roaming Call Type Summary

SS7 Application and services KPIs – Call Quality

SS7 Application and services KPIs -shortest call set up



SS7 Application and services KPIs (BICC)

BICC

GRQ Roaming Call Type Summary

BICC Details Record

SS7 Application and services KPIs (SIP-I)

SIP-I

SS7 Application and services KPIs (MAP)

MAP

SMS by MSISDN

SS7 Application and services KPIs (CAMEL)

CAMEL

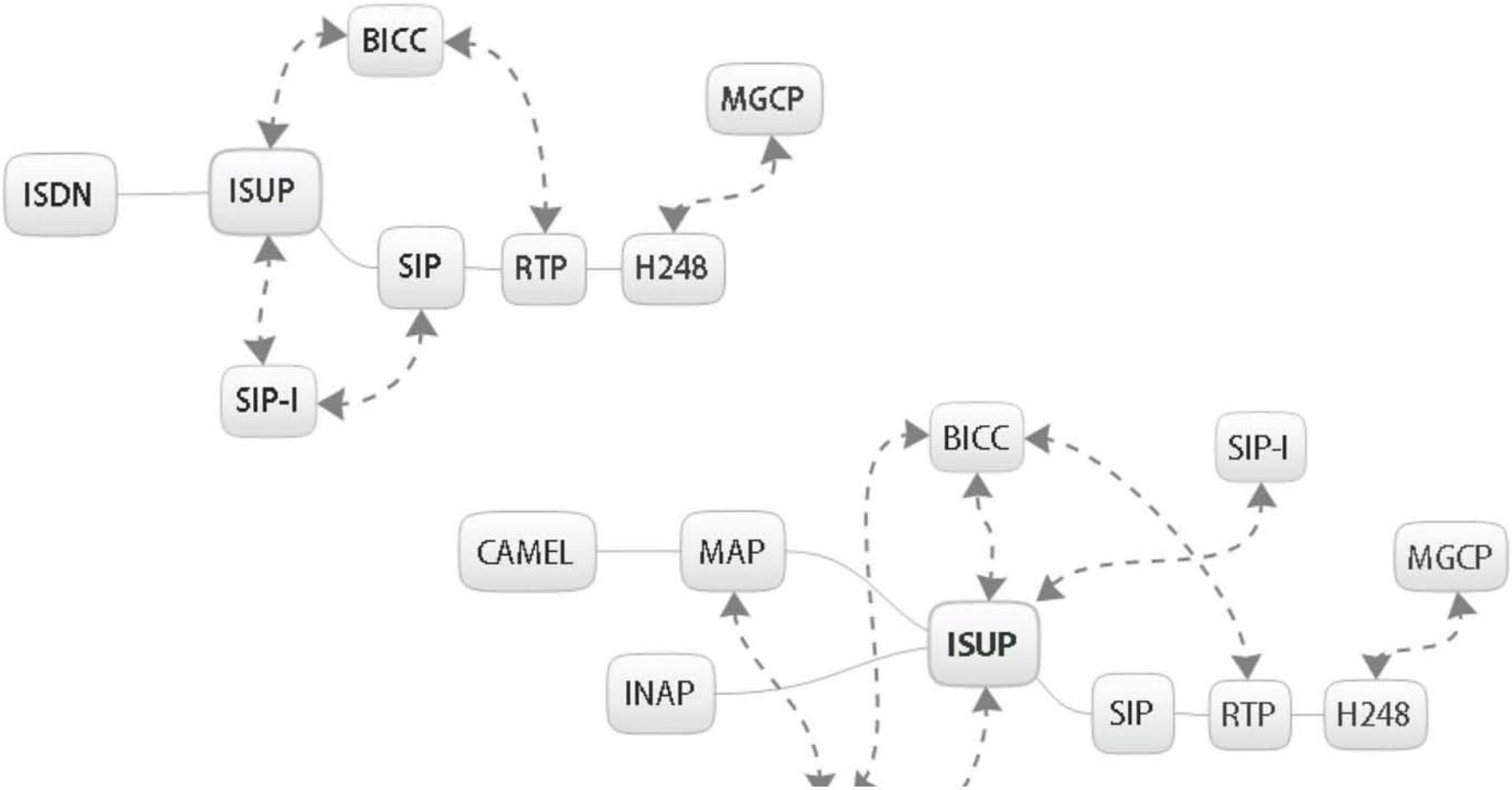
SS7 Application and services KPIs (INAP)

INAP

SS7 Application and services KPIs (Gsm-A)

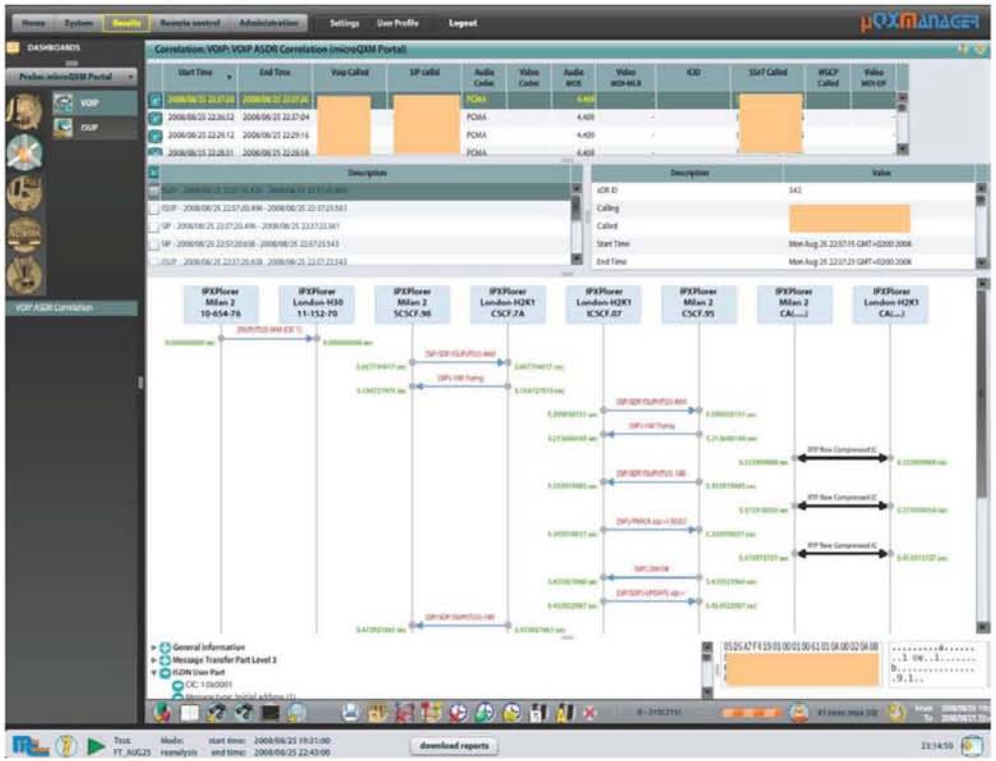
Gsm-A

Empirix provides End to End Correlation



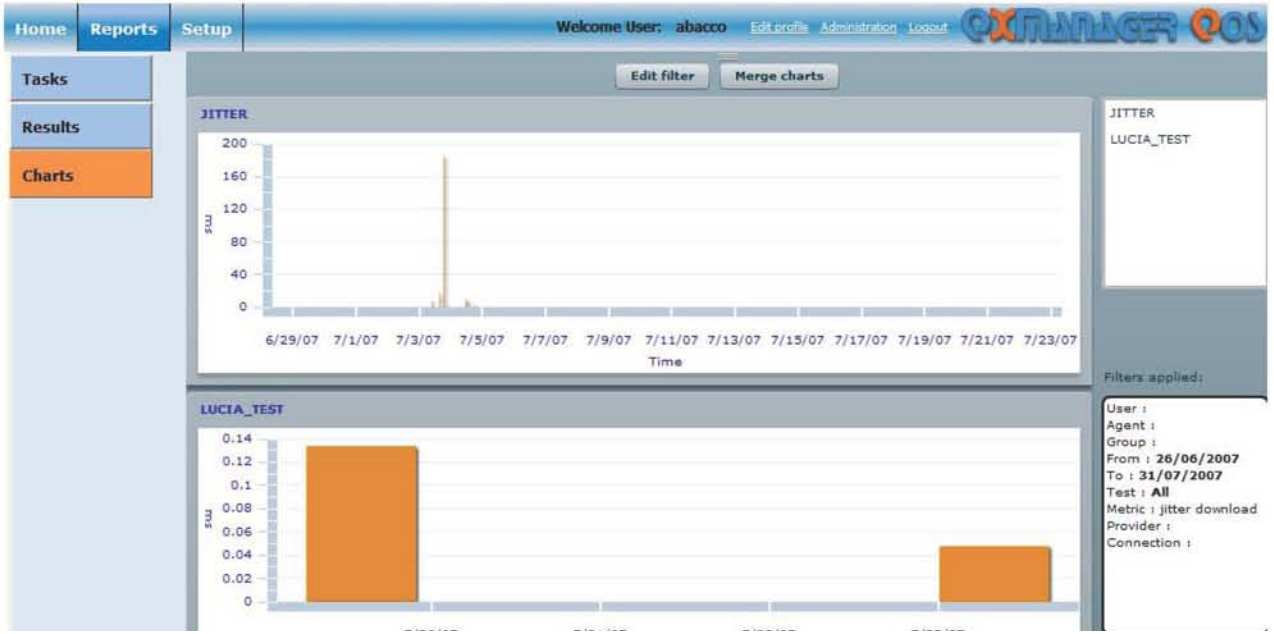
Site Correlation

- QXM and QXDC collects the ASDR™ from IPXPlorer® probes, then:
- Rebuilds the entire end-2-end session
- Correlates the ASDR™ from different sites
- Creates the correlated view including traffic and KPIs
- Brings the packets from probes if the Operator requires the HEMS™ (graphic message flow representation)



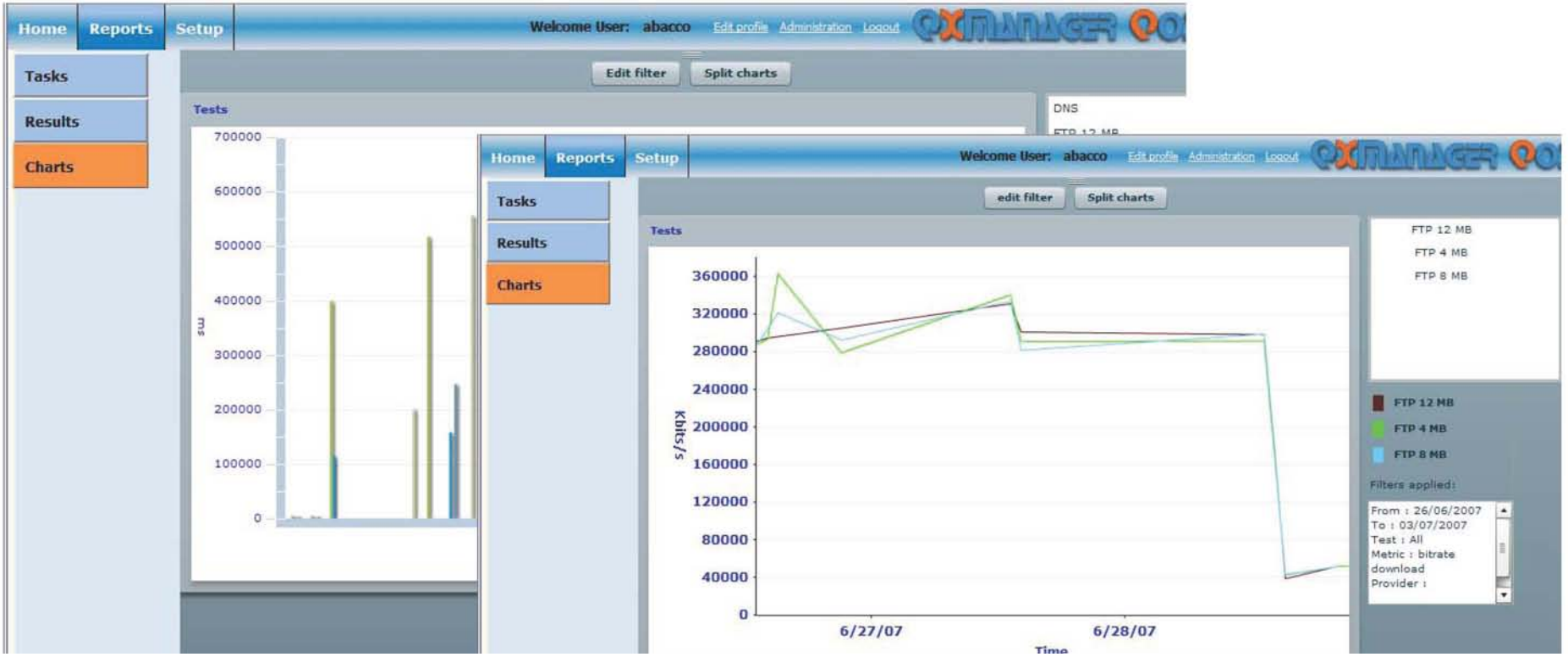
Results: VoIP Service testing

- Keep under control impairments on VoIP traffic
  - Jitter
  - Latency
  - Packet loss



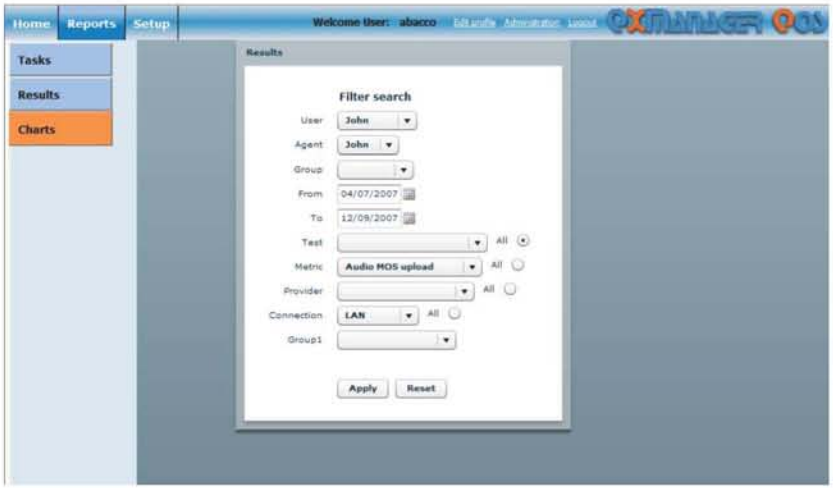
Results: Network Efficiency

- Response time, bit-rate and setup time useful for network efficiency reports.



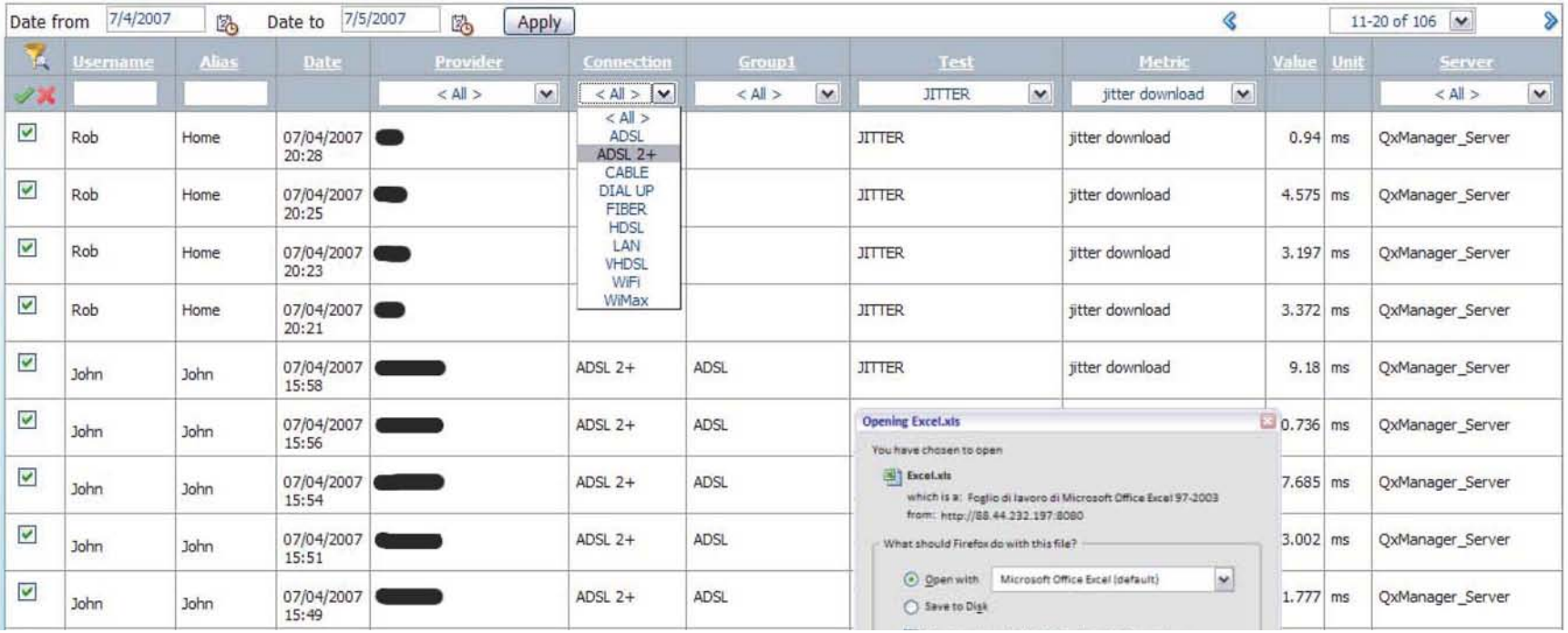
Results: Snapshots

- Reports can aggregate data based on user defined KPI depending on the target application.



Results: Exportability of the results

- Results are exportable in the following way: CSV, PDF and XML.



The Results - Aggregation

- MIP-DMA aggregates analysis results in several ways, such as:
  - Physical: site, port, VLAN,Q-in-Q, MPLS label, tunnel….
  - Network/Transport: Server, Client, Hosts, and Pairs…..
  - Equipment address: IP, Point Code, SGSG, GGSN, HLR, SP, SCP, HLR, Media Gateway, MGC, Call Agent, Proxy……
  - Signaling numbers: E164, IMSI, MSISDN, URL, email…
  - Terminal type and service
  - Per programmable groups

The Trends & Statistics

- MIP-DMA provides snapshot of analysis and trends in several modes:
  - TOP ‘N’: site, Server, Client, Hosts, Pairs, Users, calling, called, MSISDN, Equipment type, conversations, …..
  - KPIs: fastest and slowest elements, quickest responses time, bandwidth, utilization, usage, sessions, tunnels, ….
  - QoS: MOS, MDI, Jitter, other IP & services impairments,…..
  - Time interval of trends are fully programmable

The Geographic Viewer Management

- QXM and QXDC manages logical and geographic maps
- Maps representations are for probes, circuits, IP, Signaling Points, Area Codes, Service Areas, PLMNs…
- Geographic maps are real time from Enterprise Google map
- Probes/Sites are identified by the geo coordinates
- Probes can be equipped with GPS option for auto-location

Wireless user location

- monitoring Iu interface we have the location information namely, cell ID, LAC, SAC and RAC.
- This can be correlated to the subscriber based on the IMSI to provide location based information for each subscriber.

Empirix and Hammer xCentrex

Receiving feeds from various sources for customized Reports

API

BSS/OSS
(Data Source)

Enrichment

BI
Analytics

Reports &
Dashboard

CEO

C-Level

Tags

DB
scrape

Eng/Ops/Sup Mgnt

Engineers/Technicians

Reports

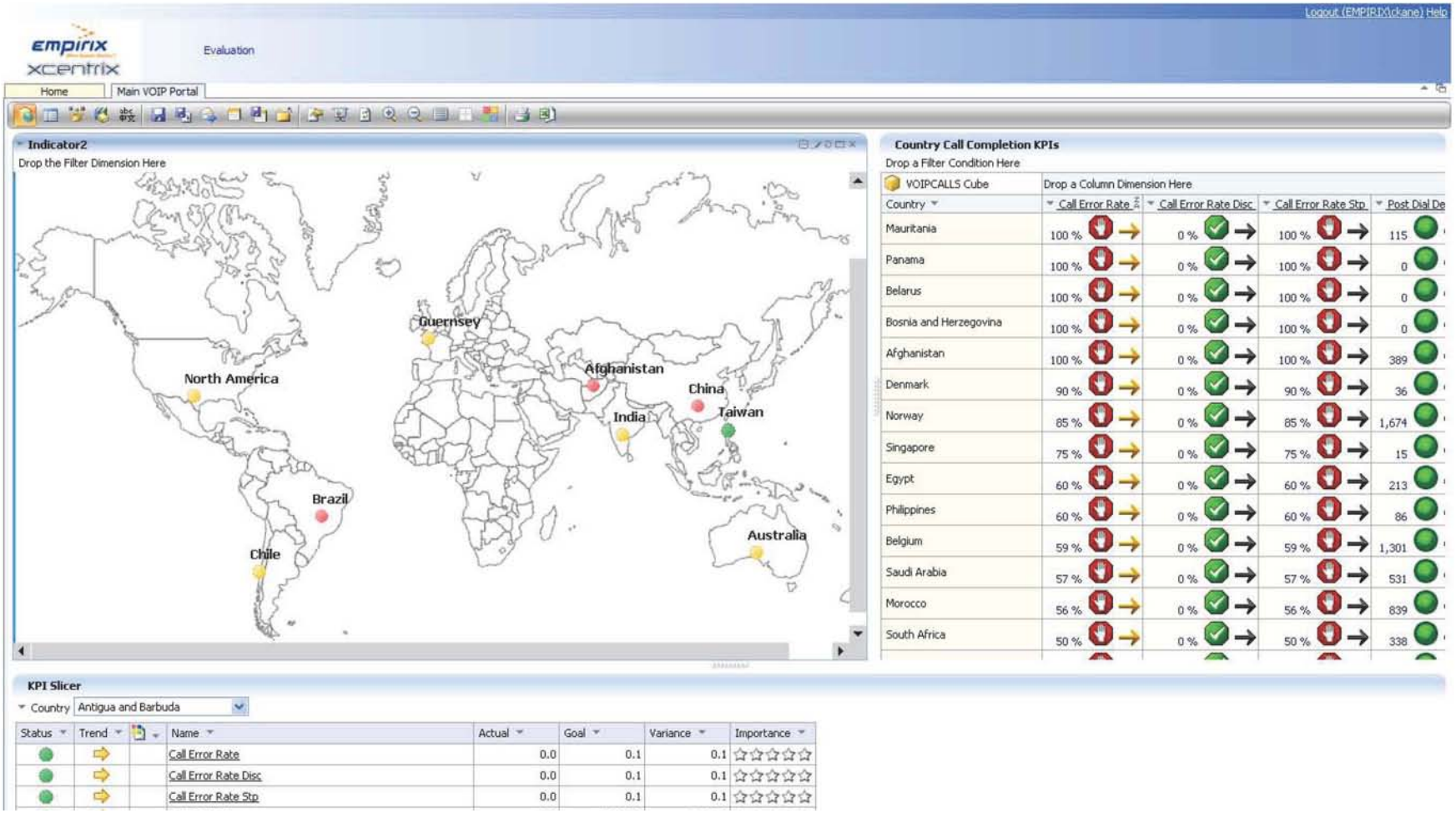
CDRs

Calls

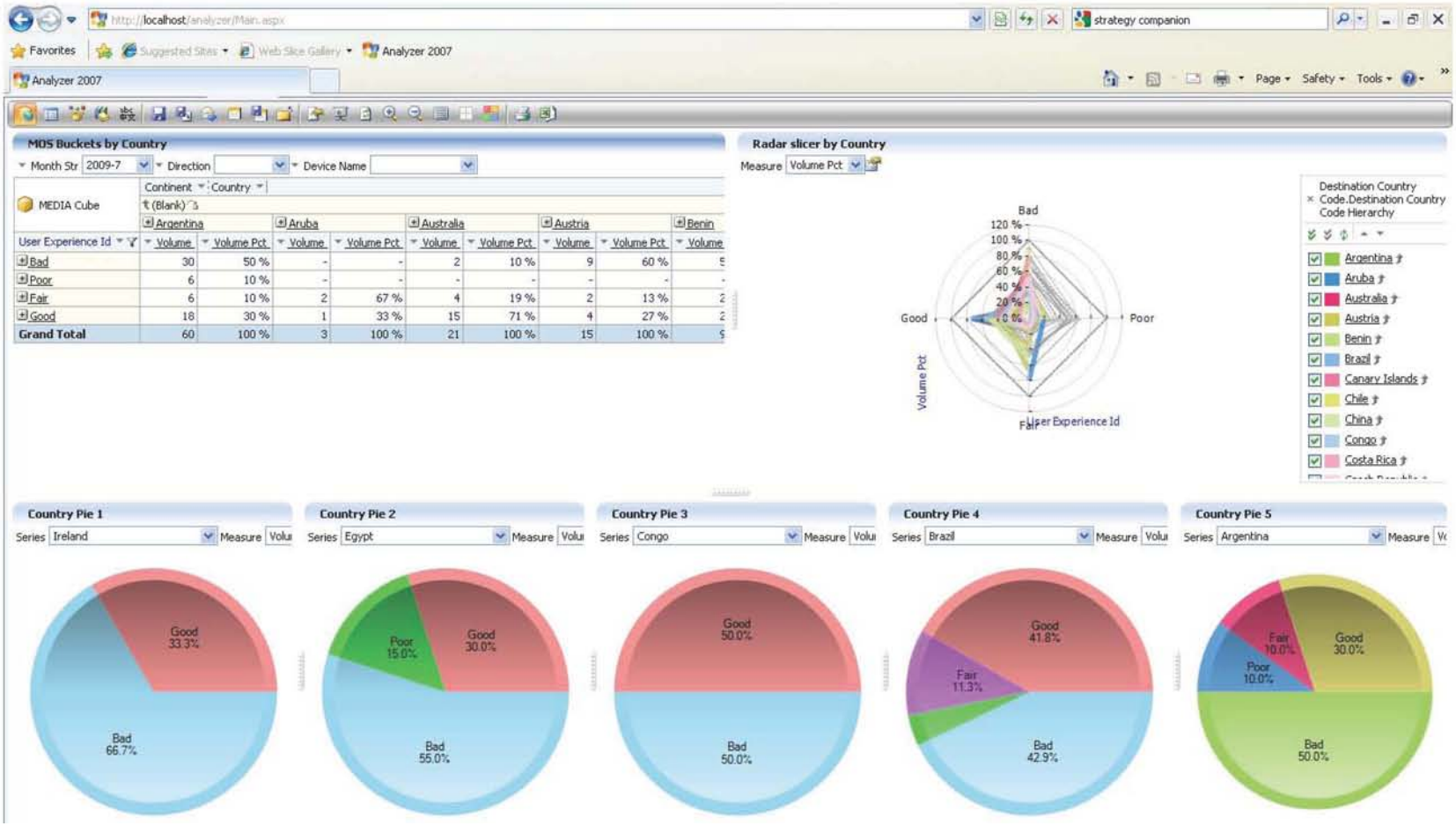
Published
Schema

Empirix monitoring solution

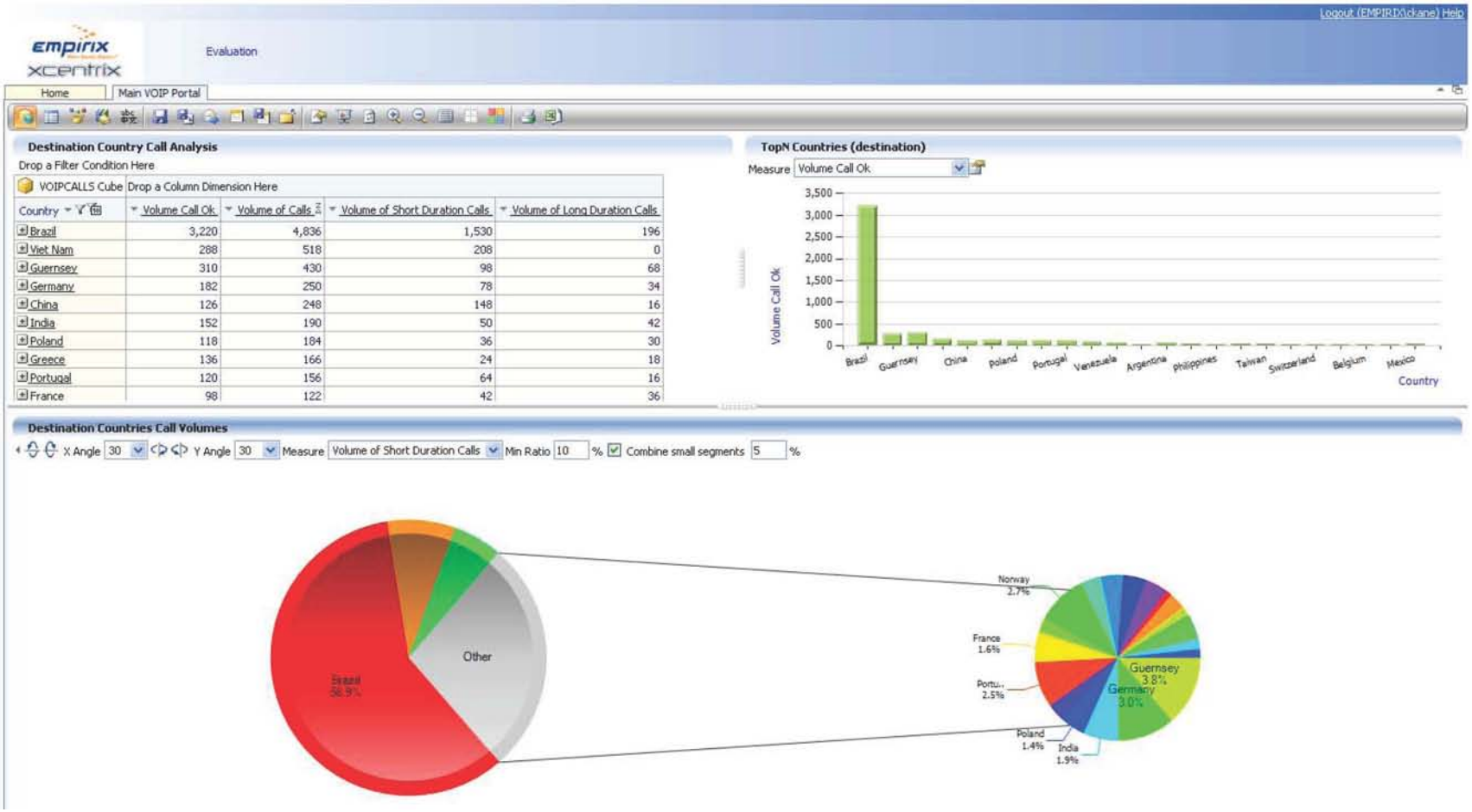
Country/World Map Dashboard KPIs



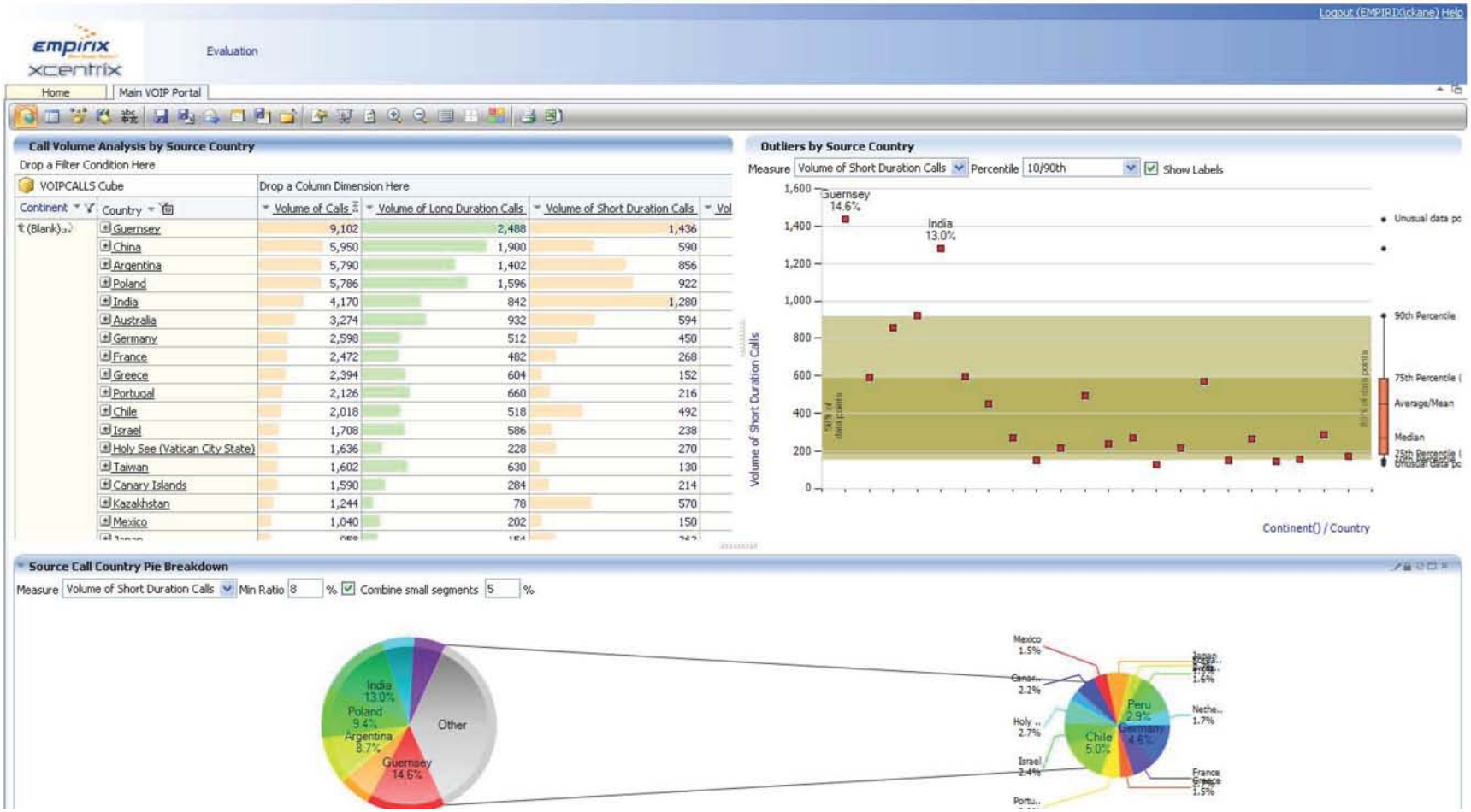
MEDIA: Favorite Country Status Dashboard



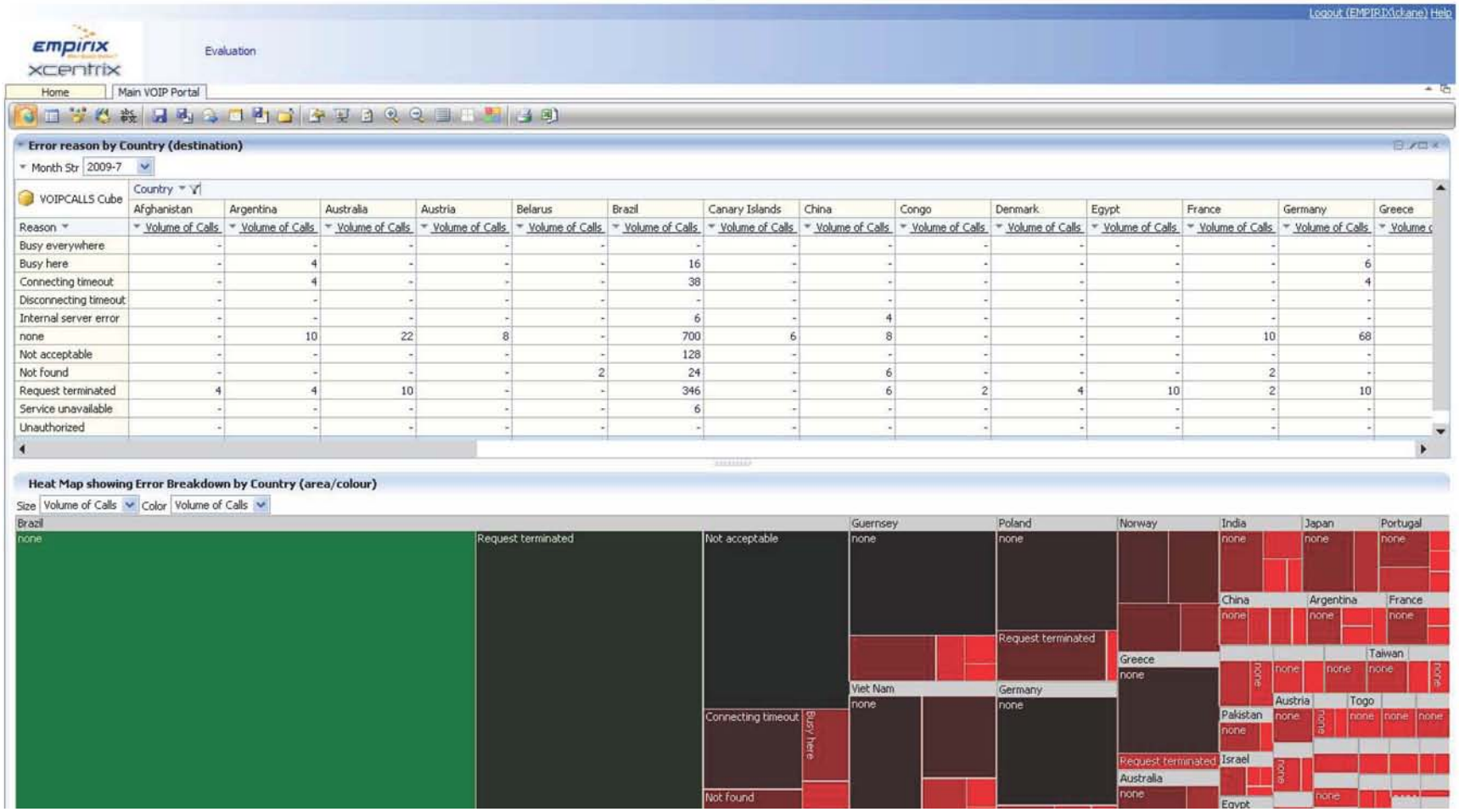
Destination Call Analysis



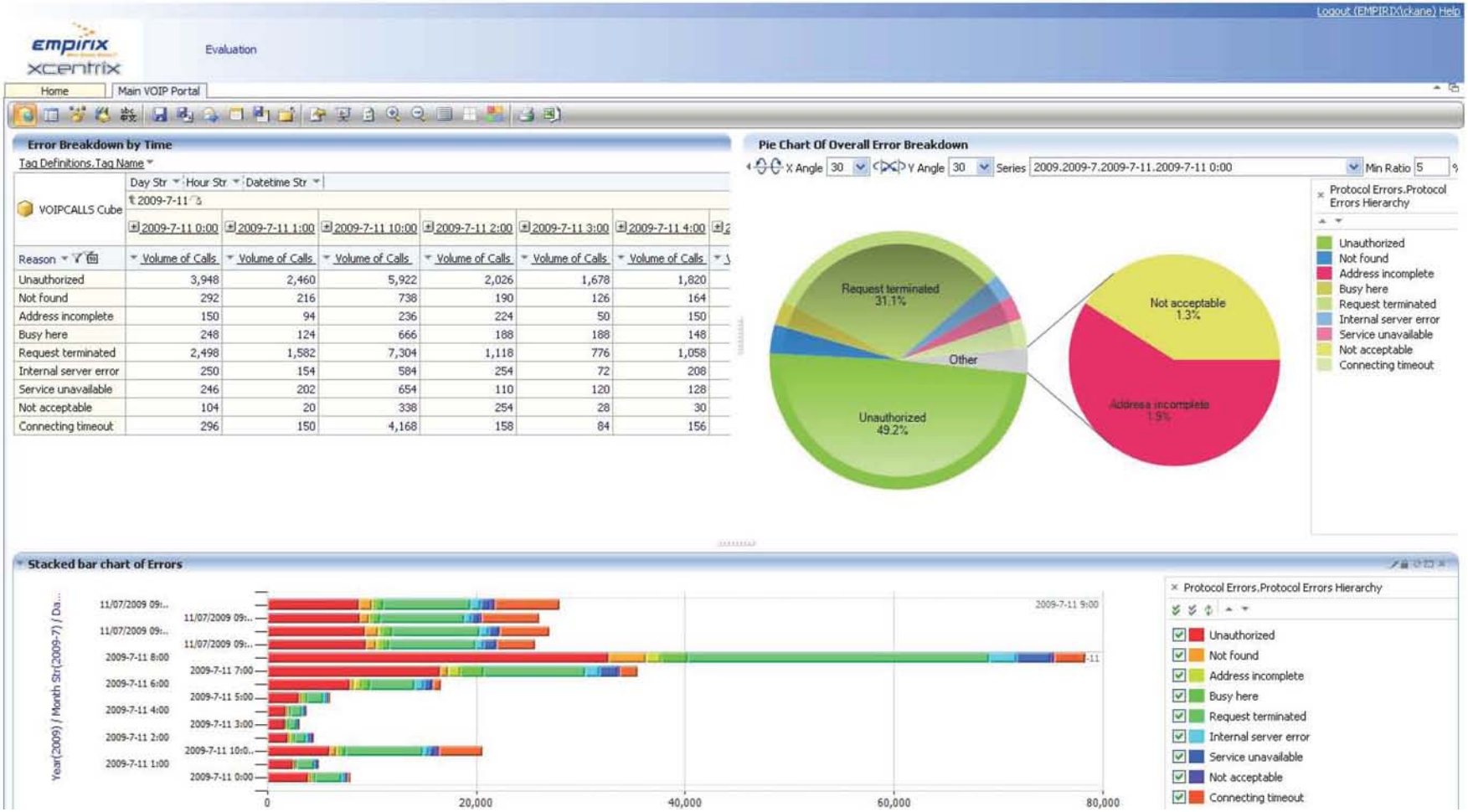
Originating Long/Short Calls identification



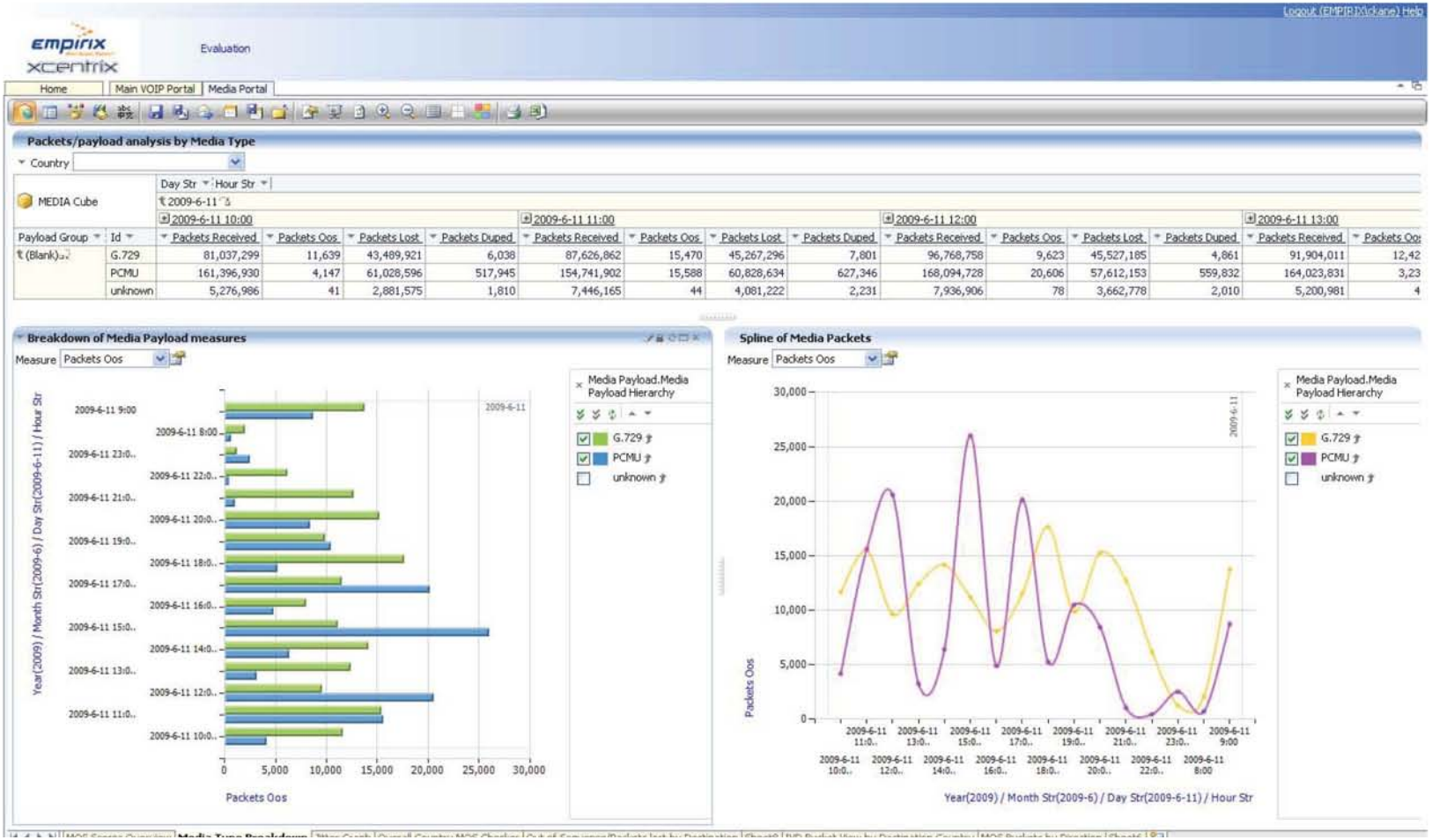
Heat Map of Errors by origin/destination



Failed Call Breakdown analysis

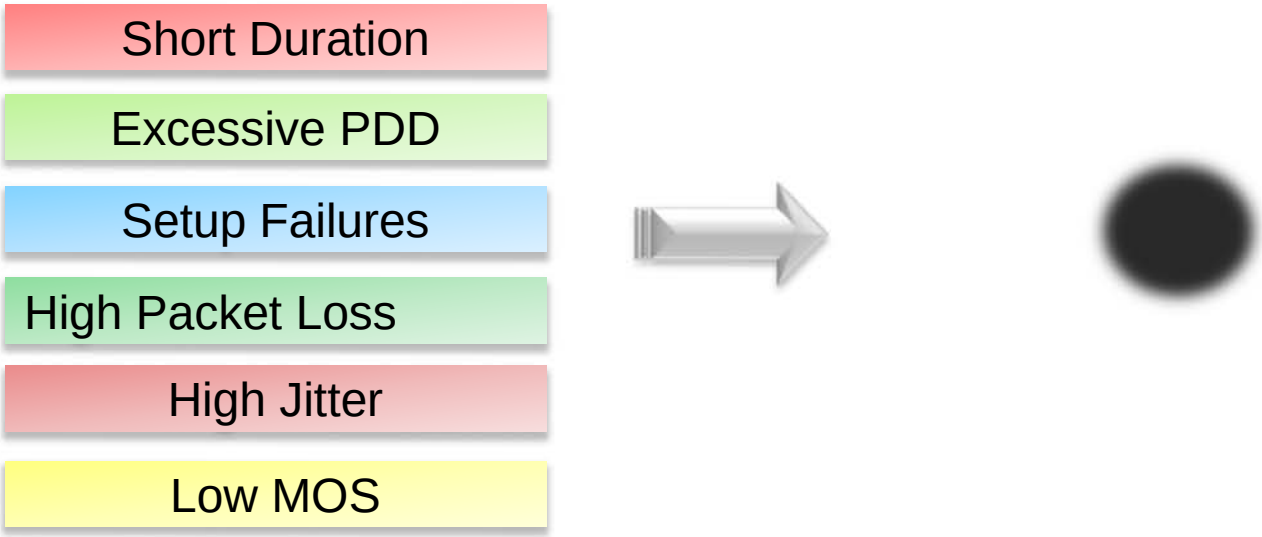


MEDIA: Payload Analysis



Example: Network Related Churn

- Problem: End user Churn – multidimensional problem proactively predicted by combining technical metrics
- Solution: BI Report that predicts potential end user churn by isolating patterns in the data:



- Value
  - End User Retention / Success of NBB investment

Example eval deployment timeline

What	Who	When
Ship system in accordance with Evaluation and Loan Agreement.	Empirix - FCC	7/16/10
Install system	Empirix - FCC	7/22/10
Provide Training & Execute Evaluation Test Plan on site	Empirix - Tom Tavares FCC - TBD	7//24-25/10
Provide remote support	Empirix SE/IE & Support	7/22/10- 7/31/10
Issue P.O. or Ship system back	FCC	**7/31/10**

Example costs

- Solution cost range from 35k upwards. Solution cost are solely dependent on size of the network and traffic volumes.

Advantages over applet on subscriber unit

- True “dashboard” vs. “snapshot”
  - Relying on applets provides snapshots with no context.
- Complete visibility end to end
  - Correlation between multi-protocol transactions
- Complete control
- Thousands of KPIs
- Customizable Reports & Analysis

Advantages (continued)

- The FCC should understand the mobile consumer's experience in the context of a shared resource. In particular, the FCC should understand how mobile data is being delivered by cell site and further, should understand the collective experience of every subscriber on the site. And for each sub, the FCC should understand what type of handset is being used and what applications are being used.
- Relying on applets means that the FCC cannot know if poor customer experience is due to heavy usage (e.g. peer to peer traffic) by another subscriber on the same sight.
- Relying on applets without having information on the relative performance of different handset types is an incomplete picture – subscribers could be getting poor throughput but could be getting poor throughput for reasons having to do with handset performance, not a carrier's network.

Empirix Monitoring Value Proposition

- Ease of use, user friendly
- Scalability
- Handling of complex correlation
- Integration of call and packet analysis
- Media quality assessment via real-time evaluation of RTP
- Integration of passive and active monitoring
- Ability to import/export data from/to various sources
- Single vendor solution

Focus on quality of Wireless Broadband services

empirix

When Quality Matters™

Thank you